ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM
PERMIT FACT SHEET – PRELIMINARY DRAFT
Permit Number: AK0053309 – Cook Inlet Energy, LLC
Osprey Platform

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501

Public Comment Period Start Date: **April 24, 2019**
Public Comment Period Expiration Date: **Revised to May 31, 2019**
Alaska Online Public Notice System

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Proposed issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit to

COOK INLET ENERGY, LLC

For wastewater discharges from

Osprey Platform
Cook Inlet, Alaska
Approximately 2 miles east of West Foreland
Latitude 60° 41’ 46.3” N, Longitude 151° 40’ 10.2” W

The Alaska Department of Environmental Conservation (Department or DEC) proposes to reissue APDES individual permit (Permit) AK0053309. The Permit authorizes and sets conditions on the discharge of pollutants from this facility to waters of the United States. In order to ensure protection of water quality and human health, the Permit places limits on the types and amounts of pollutants that can be discharged from the Osprey Platform (the facility) and outlines best management practices to which the facility must adhere.

This Fact Sheet explains the nature of potential discharges from the facility and the development of the Permit including:

- information on public comment, public hearing, and appeal procedures
- a listing of proposed effluent limitations and other conditions
- technical material supporting the conditions in the Permit
- proposed monitoring requirements in the Permit

Public Comment

Persons wishing to comment on, or request a public hearing for the Draft Permit for this facility, may do so in writing by the expiration date of the public comment period.

Commenters are requested to submit a concise statement on the Permit condition(s) and the relevant facts upon which the comments are based. Commenters are encouraged to cite specific Permit requirements or conditions in their submittals.

A request for a public hearing must state the nature of the issues to be raised, as well as the requester's name, address, and telephone number. The Department will hold a public hearing whenever the Department finds, on the basis of requests, a significant degree of public interest in a draft permit. The Department may also hold a public hearing if a hearing might clarify one or more issues involved in a permit decision or for other good reason, in the Department's discretion. A public hearing will be held at the closest practicable location to the site of the operation. If the Department holds a public hearing, the Director will appoint a designee to preside at the hearing. The public may also submit written testimony in lieu of or in addition to providing oral testimony at the hearing. A hearing will be tape recorded. If there is sufficient public interest in a hearing, the comment period will be extended to allow time to public notice the hearing. Details about the time and location of the hearing will be provided in a separate notice.

All comments and requests for public hearings must be in writing and should be submitted to the Department at the technical contact address, fax, or email identified above (see also the public comments section of the attached public notice). Mailed comments and requests must be postmarked on or before the expiration date of the public comment period.

After the close of the public comment period and after a public hearing, if applicable, the Department will review the comments received on the Draft Permit. The Department will respond to the comments received in a Response to Comments document that will be made available to the public. If no substantive comments are received, the tentative conditions in the Draft Permit will become the proposed Final Permit.

The proposed Final Permit will be made publicly available for a five-day applicant review. The applicant may waive this review period. After the close of the proposed Final Permit review period, the Department will make a final decision regarding permit issuance. A Final Permit will become effective 30 days after the Department's decision, in accordance with the state's appeals process at 18 AAC 15.185.

The Department will transmit the Final Permit, Fact Sheet (amended as appropriate), and the Response to Comments to anyone who provided comments during the public comment period or who requested to be notified of the Department's final decision.

Appeals Process

The Department has both an informal review process and a formal administrative appeal process for final APDES permit decisions. An informal review request must be delivered within 20 days after receiving the Department's decision to the Director of the Division of Water at the following address:

Director, Division of Water
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501

Interested persons can review 18 AAC 15.185 for the procedures and substantive requirements regarding a request for an informal Department review. See http://dec.alaska.gov/commish/review-guidance/informal-reviews for information regarding informal reviews of Department decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department within 30 days of the permit decision or a decision issued under the informal review process. An adjudicatory hearing will be conducted by an administrative law judge in the Office of Administrative Hearings within the Department of Administration. A written request for an adjudicatory hearing shall be delivered to the Commissioner at the following address:

Commissioner
Alaska Department of Environmental Conservation
P.O. Box 111800
Juneau AK, 99811-1800

Location: 410 Willoughby Street, Juneau

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See http://dec.alaska.gov/commish/review-guidance/adjudicatory-hearing-guidance for information regarding appeals of Department decisions.

Documents are Available

The Permit, Fact Sheet, application, and related documents can be obtained by visiting or contacting DEC between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The Permit, Fact Sheet, and other related information are located on the Department's Wastewater Discharge Authorization Program website: http://dec.alaska.gov/water/wastewater/ .

Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 555 Cordova Street Anchorage, AK 99501 (907) 269-6285	Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 410 Willoughby Avenue, Juneau Juneau AK, 99811-1800 (907) 465-5180
Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 610 University Avenue Fairbanks, AK 99709-3643 (907) 451-2183	Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 43335 Kalifornsky Beach Rd. - Suite 11 Soldotna, AK 99669 (907) 262-5210

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1.0 INTRODUCTION

On May 4, 2018, the Alaska Department of Environmental Conservation (DEC or Department) received an application from Cook Inlet Energy, LLC (CIE or applicant). CIE, a subsidiary of Glacier Oil & Gas Corporation, operates the Osprey Platform, an oil and gas production platform in coastal waters of Cook Inlet. The application is a request for the Department to reissue the Alaska Pollutant Discharge Elimination System (APDES) individual permit to reauthorize discharges, with mixing zones, from the Osprey Platform. The application also includes a request for the Department to add, within the reissuance of the APDES individual permit, authorization for new discharges of drill cuttings and drilling fluids at the seafloor and produced water. This Fact Sheet was developed based on the application and supplemental information obtained through the application process.

1.1 Applicant

This Fact Sheet provides information on the reissuance of the Permit for the following entity:

Permittee:	Cook Inlet Energy, LLC
Name of Facility:	Osprey Platform
APDES Permit Number:	AK0053309
Facility Location:	Latitude 60° 41’ 46” North, Longitude -151° 40’ 10” West
Mailing Address:	601 West 5th Avenue, Suite 310, Anchorage, AK 99501
Onsite Facility Contact:	Ms. Jennifer Henderson

1.2 Authority

The National Pollutant Discharge Elimination System (NPDES) Program regulates the discharge of wastewater to the waters of the United States (U.S.). On October 31, 2008, the Environmental Protection Agency (EPA) approved an application from Alaska to administer the NPDES Program to regulate the discharges of pollutant point sources to waters of the U.S. located in the State of Alaska. The state program, the APDES Program, is administered by DEC. Transfer of the NPDES Program to the State occurred in four phases with oil and gas facilities transferring as part of Phase IV, which occurred on October 31, 2012. Accordingly, DEC is now the APDES permitting authority for regulating the discharges associated with AK0053309 – CIE, Osprey Platform (Permit) and is reissuing the Permit for the first time post program transfer.

Clean Water Act (CWA) Section 301(a) and Alaska Administrative Code (AAC) 18 AAC 83.015 provide that the discharge of pollutants to waters of the U.S. is unlawful except in accordance with an APDES permit. The Permit is being developed per 18 AAC 83.115 and 18 AAC 83.120. A violation of a condition contained in the Permit constitutes a violation of the CWA and subjects the permittee of the facility with the permitted discharge to the penalties specified in Alaska Statute (AS) 46.03.760 and AS 46.03.761.

2.0 BACKGROUND

2.1 Permit History

The Osprey Platform initially conducted exploration drilling under the 1999 issuance of the General Permit for Oil and Gas Exploration, Development, and Production Facilities in Cook Inlet (1999 GP) developed and administered by EPA, which had NPDES authority at the time. Although the 1999 GP was applicable to exploration discharges within its entire coverage area, it was only applicable to production discharges located north of Kalgin Island. Therefore, when the Osprey Platform was converted from exploration to production status in late 2002 it was no longer eligible to discharge under the 1999 GP. Consequently, an application was submitted for an individual permit to authorize discharges from the Osprey Platform while in production status. Because production from the Osprey Platform was considered to be a New Source per the Code of Federal Regulations Title 40 Part 435.45 (40 CFR 435.45) an Environmental Assessment (EA) under the National Environmental Policy Act was required before EPA could authorize production discharges from the Osprey Platform.

EPA conducted an EA, made a Finding Of No Significant Impact, and on July 1, 2002 issued individual permit AK0053309 – Osprey Platform (2002 Permit) to the then-owner, Pacific Energy Resources Limited. The 2002 Permit authorized the discharge of seven waste streams. DEC provided certification that there is reasonable assurance that the discharges authorized by the 2002 Permit would meet State laws and regulations, with the inclusion of two mixing zones.

The 2002 Permit was reissued by EPA in 2009 (2009 Permit). DEC again provided certification that there is reasonable assurance that the discharges authorized by the 2009 Permit would meet water quality standards, with the inclusion of one mixing zone. However, many of the discharges historically have not been discharged from the Osprey Platform because UIC well disposal options were available. These discharges are authorized as a contingency should injection become infeasible or unavailable. The 2009 Permit was administratively extended by DEC upon the timely receipt of a complete application for permit reissuance from the Permittee.

2.2 Facility Description

The Osprey Platform is located approximately 65 miles west-southwest of Anchorage, Alaska. The facility is located offshore, 1.8 miles southeast of West Foreland in Cook Inlet (Appendix A, Figure 1). Based on its proximity the Osprey Platform is in coastal of Cook Inlet in approximately 45 feet for water.

The Osprey Platform (Appendix A, Figure 2) is an active off-shore oil and gas production platform established during late June 2000. Production wells from the platform are directionally drilled farther offshore to the Redoubt unit, located four miles from shore. Produced fluids from the Osprey Platform wells are piped to the Kustatan Production Facility located on-shore approximately 2.8 miles away, for separation of water, gas, and crude oil. The following section outlines the applicable discharges to be included in the Permit for this reissuance based on the CIE application.

2.3 Applicable Discharges and Descriptions

The following wastewater discharges have been requested in the application for authorization under the Permit:

DISCHARGE NUMBER	DESCRIPTION
002	Deck Drainage
004	Graywater
005	Desalination Unit Wastes
007	Boiler Blowdown
008	Fire Control System Test Water
009	Noncontact Cooling Water
012	Excess Cement Slurry
013 (New)	Fluids, Cuttings, and Cement at the Seafloor
014	Waterflooding Wastewater
015 (New)	Produced Water

The Osprey Platform is currently authorized to discharge deck drainage, domestic wastewater (treated black water and graywater), and several miscellaneous wastes (desalination, boiler blow down, fire test water, noncontact cooling water, excess cement slurry, and waterflooding). Because the Osprey has four underground injection control (UIC) wells allowing for disposal, drilling fluid and drill cuttings, produced water, and many of the miscellaneous discharges have not historically been discharged from the Osprey Platform. However, the current application submitted by CIE requests authorization to discharge produced water due to infeasibility of continuing to inject produced water into the formation at the Osprey that is not only derived from oil production at the Platform but also from onshore wells in the West McArthur River Unit and the Redoubt Unit.

Historically, potable water has been delivered to the Osprey Platform by vessels, at notable cost. Although included in the existing Permit, CIE has only recently installed a desalination system on the platform designed to serve the minimum population of the platform. Hence, a population greater than the desalination system capacity would necessitate continued potable water delivery during peak operations. The type of desalination system installed does not use chemicals and will not discharge greater than 5,000 gallons per day (gpd).

The Osprey Platform generates wastewater that is segregated into two streams: graywater and black water. Graywater consists of water from kitchens, clothes washing, lavatory sinks, and showers. It does not contain water from toilets and urinals (black water). Both waste streams are separately treated, and also disposed separately (Appendix A, Figure 3). The black water is disposed by injection deep underground while graywater is discharged under the Permit. Per 18 AAC 72.050, the discharge of treated black water or graywater requires meeting secondary treatment standards. Because the treated black water is injected rather than discharged, there is insufficient analytical data to ascertain if the discharge would meet secondary treatment limits for BOD_5 and TSS as required in the 2009 Permit. In addition, the treatment system has not obtained final approval to operate due to incomplete submittals and deferred coordination by DEC. Rather than seeking DEC approval to discharge treated black water, CIE has decided to not include the discharge in the Permit as a contingency to injection. Hence, if the ability to inject is not available, CIE will haul the treated black water to shore for disposal by other means. Lastly, in order to discharge graywater that exceeds secondary standards the applicant is required to demonstrate primary treatment is attained and request a waiver to secondary standards per 18 AAC 72.060. These actions also have not been completed similar to the majority of Cook Inlet oil and gas platforms. DEC intends to work toward closure on these regulatory requirements for graywater during the next term of the Permit.

Produced water derived from oil production at the Osprey Platform and also from onshore wells in the West McArthur River Unit and the Redoubt Unit, are injected at the Osprey Platform, either for reuse as

waterflood for enhanced oil recovery or for disposal as industrial waste. As production in the West McArthur River Unit and the Redoubt Unit matures in the existing wells, the volumes of produced water increases. When the produced water volume exceeds the reuse and reinjection needs, an alternative disposal option becomes required. Currently, the Permittee disposes 7,500 barrels per day (bbl/d) into four injection wells located at the Osprey Platform, which represents maximum capacity, and the receiving shallow formation has become over-pressurized. Installation of additional injection wells is not practicable due safety concerns related to well control if additional disposal wells were to be drilled into the currently over-pressurized shallow formation. Increasing injection into the deeper oil-producing formations would reduce enhanced oil recovery efficiency; the ideal ratio is 1:1 for water injected to oil recovered. Therefore the discharge of produced water has become necessary to continue or expand oil production, which has economic and social benefits in the vicinity of the discharge.

Due to the infeasibility of continuing to inject produced water from onshore wells into the formations of the wells at the Osprey Platform, in addition to the previously authorized discharges, the Permittee has requested authorization to discharge produced water into Cook Inlet. Furthermore, the discharge of drilling muds, cuttings and cement at the sea floor was not included in the 2009 Permit and the Permittee has requested in the application for reissuance that it be added to the Permit as a new discharge.

3.0 WASTEWATER CHARACTERIZATION

The wastewater discharges requested by the applicant are characterized in this section. Characterizations are structured to first provide a general description, followed by specific information pertinent to discharges as described through the application process and authorized under the Permit. The identification of potential parameters of concern (POCs) includes consideration of meeting water quality standards (WQS) or technology-based effluent limits (TBELs) derived from industrial wastewater effluent limit guidelines (ELGs) in 40 CFR 435 or developed using case-by-case best professional judgment (BPJ) per 40 CFR 1y them for further evaluation for mixing zones and, possibly, reasonable potential analysis (RPA) to determine if water-quality based effluent limits (WQBELs) should be developed.

Discharge characterization for water quality POCs is necessary to derive maximum probable parameter concentrations that are used to evaluate and size mixing zones as well as maximum expected concentrations (MECs) used in the reasonable potential analysis (RPA). The objective of characterization is to categorize parameters based on their likelihood of exceeding water quality criteria or existing limits. Only those parameters that warrant consideration as being a driving parameter for mixing zones or have a reasonable potential to exceed, or contribute to an exceedance, of water quality criteria (hereinafter reasonable potential) require a WQBEL. The following subsections provide characterization for these objectives.

3.1 Discharge 002 – Deck Drainage

Deck drainage refers to any wastewater generated from platform washing, deck washing, spillage, rainwater, snowmelt, and runoff from containment, gutters, and drains, including drip pans, wash areas, and helicopter pad drainage.

When water from rainfall or from equipment cleaning comes in contact with oil-coated surfaces, the water becomes contaminated and must be treated. At the Osprey Platform, oil and water in deck drainage are gravity-separated in a surge and skim weir tank (oil-water separator): the oil floats to the top of the tank and water is discharged from the lower portion of the tank. For convenience, graywater

(Discharge 004) is currently also treated in this same oil-water separator. However, in the future the permittee may bypass the graywater around the oil-water separator. The oil from the top of the tank is collected and shipped off-platform for processing or disposal. The separated deck drainage wastewater from the weir tank is batch-discharged.

While oil and grease are the primary pollutants identified in the deck drainage waste stream, it can include pollutants from detergents used in platform and equipment washing, oil and grease from temporarily extended or suspended objects and equipment, and various other chemicals used during operations which may include minor amounts of drilling fluid additives, ethylene glycol, lubricants, fuels, biocides, surfactants, corrosion inhibitors, solvents, paint cleaners, bleach, dispersants and coagulants. However, best management practices (BMPs) can be effective at minimizing or preventing the inclusion of these chemicals in deck drainage discharges, and the development of BMPs are included as a requirement in the Permit. Therefore oil and grease determined by presence of a sheen remains the primary POC associated with deck drainage.

Deck drainage accumulates intermittently and the volume is dependent on precipitation. Per the application submitted in 2014, deck drainage average flow volume was calculated based on historical records. The maximum daily flow rate of 18,000 gallons per day (gpd) as deck drainage reported in application Form 2C was obtained from the mixing zone application submitted in year 2000 as a reflection of reasonable maximum flow volume. However, the long-term average flow and 30-day maximum flow rates from discharge monitoring reports from the past five years were calculated to be much less, 1,435 gpd and 5,145 gpd, respectively.

3.2 Discharge 004 – Graywater

Graywater consists of water from kitchens, lavatory sinks, and showers. The source of water to the kitchens, lavatory sinks, and showers is desalinated seawater which has also been disinfected using sodium hypochlorite.

The Osprey Platform will generate and discharge graywater. Because it is domestic wastewater, graywater is held to the treatment requirements in 18 AAC 72.050. Per18 AAC 72.060, graywater must receive at least primary treatment prior to being discharged. Primary treatment is defined per 18 AAC 72.990(50) as attaining 30 percent (%) reduction in both five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS). The graywater at the Osprey Platform receives primary treatment using a primary settling tank to allow floatable solids to be skimmed off the top and settleable solids to be deposited at the bottom. Although 30 % removal for BOD5 and TSS is likely attained by the primary settling tank, there is currently insufficient information to characterize the graywater to demonstrate this achievement. Nonetheless, the POCs for graywater include BOD_5, TSS, total residual chlorine (TRC) from the potable water, and floating materials including solids, foam, garbage, and oily sheens.

On the Osprey Platform, the graywater wastewater flow rate was calculated based upon 100 gpd per capita. An average population of five and a maximum population of 60 were used to calculate flow volumes of 500 gpd and 6,000 gpd, respectively.

3.3 Discharges 005, 007, 008, 009, 012, 013, and 014 – Miscellaneous Discharges

Multiple discharges are categorized as miscellaneous due to their variable, typically low flows, and intermittent use of chemical additives. The most common types of chemicals include biocides or bactericides, oxygen scavengers, scale and corrosion inhibitors, coagulants, defoaming agents and

dispersants. These miscellaneous discharges may be either seawater or freshwater and are discussed together.

3.3.1 Discharge 005 – Desalination Unit Wastewater

Fresh water for drinking and other uses at the facility is supplied by a desalination unit. Desalination unit waste at this facility will be the concentrated brine resulting from the extraction of freshwater from seawater by evaporation/condensation. The concentrated brine from the desalination unit is similar to seawater in chemical composition, but with higher anion and cation concentrations.

Although authorized for discharge in the 2009 Permit, desalination unit waste has not been discharged from the facility for there to be associated discharge monitoring data to characterize the waste. Based on knowledge of the system, the potential POCs for the desalination unit wastewater are salinity, temperature, and TSS or turbidity. Chronic toxicity is not considered a POC because the desalination system used at the Osprey Platform does not use chemicals. The applicant reports an estimated maximum flow of less than 5,000 gpd.

3.3.2 Discharge 007 – Boiler Blowdown

Boiler blowdown is a low volume, intermittent discharge of heated freshwater from a closed boiler system. Boiler blowdown consists of water and concentrated mineral solids buildup created by the heating and consequent evaporation of water inside boiler drums and is only slightly cooler than boiling water, at 96 °C. After discharge of boiler blowdown, freshwater is added to maintain water quality characteristics in the closed boiler system (DEC 2015). No chemical additives have been identified in the application.

Although authorized for discharge in previous permits, boiler blowdown has not been discharged from the facility because it has been injected underground. Because boiler blowdown has not been discharged, there is no associated discharge monitoring data to characterize the effluent. However, the potential POCs for the boiler blowdown include temperature and chronic toxicity from chemical additives, if used.

The boiler blowdown average discharge flow rate provided in the reissuance application, 100 gpd, was estimated based on typical flow for boiler blowdown on an oil and gas production platform.

3.3.3 Discharge 008 – Fire Control System Test Water

Fire control system water is seawater released during training of personnel in fire protection or monthly testing and maintenance of fire protection equipment on the platform. Fire control system water discharges occur as an intermittent overboard discharge. The discharge is circulated seawater typically with no chemical additions.

The permittee reported an average daily flow rate of 13,358 gpd, with a maximum daily flow rate of 120,000 gpd on the application. The flow rates calculated using the values reported on DMRs from January 2012 through June 2018 resulted in lower values than reported in the application.

3.3.4 Discharge 009 – Noncontact Cooling Water

Noncontact cooling water is seawater used for noncontact, once-through cooling of various pieces of machinery (e.g., power generators) at the facility. Noncontact cooling water is a continuous discharge that has the potential to be 2 – 45 °C (3.6 – 81 °F) warmer than the receiving water, which is generally at 0 – 1 °C (32 – 34 °F). Although authorized for discharge in previous permits, noncontact cooling water

has not been discharged from the facility; it historically has been either injected in UIC wells or transported onshore for disposal.

Because noncontact cooling water has not been discharged, there is no associated discharge monitoring data from chemical analysis or temperature measurements. The renewal application referenced the data presented in the previous application associated with the 2009 Permit. Noncontact cooling water discharge temperatures of 14.8 – 23 °C (58.6 – 73.4 °F) have been reported in recent applications for other existing Cook Inlet platforms. The maximum temperature of 25°C from the application submitted in 2014 was used for the effluent maximum daily temperature.

Similar to fire control system water, no chemical additives have been identified in the application, but use of biocides or corrosion inhibitors is common with noncontact cooling water. In addition, coagulants and dispersants are also sometimes used at similar facilities. Therefore, the POCs for noncontact cooling water include temperature and chronic toxicity from potentially added chemicals.

The application indicates an average discharge rate of 1.89 million gallons per day (mgd) of noncontact cooling water. Due to the relatively large volume of noncontact cooling water requested for authorization to discharge when compared to those of the rest of the other miscellaneous discharges, the characteristics of noncontact cooling water could govern the size a discharge mixing zone for this facility. To account for chronic toxicity and temperature effects, a mixing zone is evaluated in Section 5.3.

3.3.5 Discharge 012 – Excess Cement Slurry

Excess cement slurry may be discharged from equipment washdown during drill casing installation. During well construction, a small amount of cement may be released when the lines are washed or when spill-over occurs. In addition, if the remaining cement from a batch at the end of well construction may be overboarded.

Although authorized for discharge in previous permits, excess cement slurry has not been discharged recently from the facility; it historically has been transported onshore for disposal. Because excess cement slurry has not been discharged, there is no associated discharge monitoring data from chemical analysis. Because cement can come into contact with the formation, hydrocarbons (as indicated by an oily sheen) is a POC. In addition, the dispersion of cement in the water is expected to increase turbidity similar to drilling fluids and drill cuttings due to the fine-grained material content, resulting in the need for a mixing zone (See Section 5.3). Also similar to drilling fluids and drill cuttings, the coarse-grained fraction of the cement could result in a short-term zone of deposit if discharged during slack tide. However, the applicant did not request a zone of deposit given the current speeds at the Osprey Platform location.

Flow volumes are estimated in the application at an average discharge rate of 2,000 gpd, intermittently, with an average frequency of three days per week when cementing activities are occurring.

3.3.6 Discharge 013 – Drilling Fluids, Cuttings and Cement at the Seafloor

Drilling fluid, drill cuttings, and cement are materials discharged at the seafloor during various phases of drilling operations. Small volumes of discharge may occur at the well location during spudding, re-entering an abandoned, shutting-in, or plugging a well, or during cementing operations before casing is set for plugging and abandoning, or shutting-in wells. This discharge also results from disconnecting the marine riser on drill ships and semisubmersibles. Aside from cement, cement extenders, accelerators, and dispersants are the main chemicals added to this discharge.

The discharge of drilling fluids, cuttings and cement at the sea floor was not included in the 2009 Permit, and the applicant has requested that it be added as a new discharge with the reissuance of the Permit. This discharge is required for the proper abandonment of wells on the Osprey Platform. The applicant does not have any available chemical analysis or flow data. The flow volumes provided by the applicant were taken from the Cook Inlet Oil & Gas Exploration General Permit for the maximum and average flows.

Based on typical volume estimate reported in Cook Inlet, the discharge volume is estimated to be 3,500 gpd when discharges occur. Similar to excess cement slurry, the POCs are hydrocarbons (oily sheen) and turbidity, requiring an evaluation of mixing zone in Section 5.3.

3.3.7 Discharge 014 – Waterflooding

Freshwater, brine/seawater, and production chemicals sometimes are injected into a reservoir (waterflood) to enhance both petroleum recovery rates. In most cases, the seawater goes through a treatment process, including sand filtration. Waterflooding wastewater includes filter backwash used to periodically to remove sediment and detritus from the sand filters. Chemical additions commonly include biocides (primarily chlorine but some aldehydes), oxygen scavengers, scale and corrosion inhibitors, coagulants, clarifiers, defoaming agents and dispersants. In the 2009 Permit, waterflooding was designated as discharge 021 - Filter Backwash but is being re-designated as discharge 014 – Waterflooding in the Permit to be consistent with the designations of other similar permits in Cook Inlet.

At the Osprey Platform, the waterflooding system has not been constructed but has been designed. The design has seawater going through a treatment process, including filtration and the addition of chemicals (e.g., coagulants and chlorine to destroy microorganisms growing on the sand) with the filter backwash being treated for pH control and aerated to remove the residual chlorine, if present. The filter backwash water does not come into contact with waterflooding chemicals for preparation for injection or other downhole operations. Approximately every two to three weeks the filter may be treated with a biocide consisting of a blend of chemicals, including tetrakis(hydroxymethyl)phosphonium sulfate (THPS), to remove bacteria that is not significantly affected by chlorine. THPS is widely used in industrial systems that discharge to surface water because it decomposes quickly to a simple salt. A light treatment, either ultra-violet or natural, may be added to more thoroughly remove chlorine, if needed. The chlorine is expected to be removed to an extent such that a mixing zone for chlorine is not needed for compliance with WQS. Per the application, although this discharge was included in the 2009 Permit, the Osprey Platform has never generated this discharge and, therefore, no characterization data is available. Hence, the chlorine concentration or chronic toxicity in the discharge cannot be determined at this time. Also note that use of chlorine or THPS is proposed to be batch dosed into the system. Because the chemicals are used intermittently, the exposure period of the chemicals in the receiving water would be too shore to constitute a exceedance of chronic WET criteria; the chronic WET criteria is predicated on a continuous exposure period of four days. The waste stream consists primarily of salts, sediment, trace elements and chemical additives that may impart chronic toxicity so the POCs associated with waterflooding wastewater include TRC and chronic toxicity.

The applicant provided an estimated long-term average rate of 500 gpd and an estimated maximum daily flow rate of 2,000 gpd for the waterflood wastewater discharge.

3.3.8 Discharge 015 – Produced Water (New)

Produced water often is generated during the production of oil and gas from onshore and offshore wells. The Osprey Platform previously has not discharged produced water; the produced water has been

injected deep underground rather than discharged to surface water. Although the permittee plans to continue injection in the near-term, the permittee realizes that injection will no longer be a practicable long-term disposal alternative. Accordingly, the permittee has requested authorization to discharge up to 1.05 mgd of produced water under the Permit so that they can continue to operate.

3.3.8.1 General Characteristics of Produced Water

Produced water often is generated during the production of oil and gas from onshore and offshore wells. Gas wells tend to produce less produced water than oil wells. Formation water is seawater or fresh water that has been trapped for millions of years with oil and natural gas in a geologic reservoir consisting of a porous sedimentary rock formation between layers of impermeable rock within the earth crust (Collins, 1975). When a hydrocarbon reservoir is penetrated by a well, the produced fluids may contain this formation water, in addition to the oil, natural gas, gas liquids, and waterflood injected into the formation for enhanced oil recovery. Fresh water, brine/seawater, and production chemicals sometimes are injected into a reservoir to enhance both recovery rates and the safety of operations and these surface waters and chemicals sometimes penetrate to the production zone and are recovered with oil and gas during production. Produced water (formation and injected water containing production chemicals) represents the largest volume waste stream in oil and gas production operations on most offshore platforms. Produced water may account for 80% of the wastes and residuals produced from natural gas production operations (Neff, 2011).

Produced water is a complex mixture of dissolved and particulate organic and inorganic chemicals. Common parameters of concern include ammonia (as Nitrogen), total aromatic hydrocarbons (TAH), total aqueous hydrocarbons (TAqH), and various metals. The physical and chemical properties of produced water vary widely depending on the geologic age, depth, and geochemistry of the hydrocarbon bearing formation, as well as the chemical composition of the oil and gas phases in the reservoir, and production chemical additions.

3.3.8.2 Specific Produced Water Characteristics for the Osprey Platform

Because there is no historic data that can be used for evaluating mixing zones and effluent limits, DEC requested that the permittee characterize the produced water waste stream that is currently injected at the Osprey Platform. The permittee collected samples from September 5, 2017 through December 11, 2017 for laboratory analysis of the content of oil and grease, both volatile and polycyclic aromatic hydrocarbons, and total recoverable metals, including total mercury. Note that the collected data represents the use of existing technology, which may be upgraded in the future in order to meet technologically determined treatment requirements. The characterization data were compared against water quality criteria and only those analytes exceeding the respective water quality criteria were retained and identified as POCs. Note that if the analytical results did not result in detectable concentrations, they have not been included in the characterization. The characterization data for the POCs for the Osprey Platform produced water are summarized in Table 1.

Table 1: Osprey Platform Produced Water (Discharge 015) Characterization

POC [1] (Units)	Data[2]	Water Quality Criteria			Observed Range (Low – High, Average)[3]
		Acute	Chronic	Human Health	
Oil and Grease [4] (mg/L)	6/6	– –	– –	– –	*39.4 – 64.3; 53.2*
TAH (mg/L)	12/12	– –	0.010	– –	**4.23 – 6.93; 5.94**
TAqH (mg/L)	12/12	– –	0.015	– –	**4.50 – 7.11; 6.18**
Copper (µg/L)	8/8[5]	5.8	3.7	1,300	1.76 – **71.3; 14.92**
Manganese (µg/L)	12/12	– –	– –	100	**361** – **1,800**; **1,386**
Mercury (µg/L)	7/7[6]	2.1	1.1	0.051	0.004 - **0.088**; 0.036
Nickel (µg/L)	12/12	74.7	8.3	4,600	**15.2 – 124, 68.5**
Zinc (µg/L)	9/12	95.1	85.6	69,000	5.99 – **670; 143.5**

Notes:

1. Metals are reported as total recoverable except mercury, which is reported as total
2. The number of detectable data points versus total data points [Detected/Total].
3. Values that exceed acute, chronic, or human health water quality criteria are presented in bold. Values that exceed ELGs are italicized. For values that were not detectable at or above the method detection limit, the value used for characterization was the method detection limit.
4. The maximum daily limit (MDL) of 42 mg/L and average monthly limit (AML) 29 mg/L are the ELGs for oil & grease.
5. Four non-detectable data points with method detection limits above the acute water quality criteria were excluded.
6. Five non-detectable data points with method detection limits above the acute water quality criteria were excluded.

Based on the select characterization data summarized above, oil and grease (which has ELG values), TAH, TAqH, copper, manganese, mercury, nickel, and zinc are retained as POCs and warrant consideration for being included in the mixing zone evaluation. Although ammonia was not evaluated, DEC believes ammonia will be present in the effluent to the degree that dilution would be required to meet water quality criteria but not the degree of triggering reasonable potential. Of these POCs, TAH is the obvious driving parameter for the chronic mixing zone while copper is the driving parameter for the acute mixing zone and each will require a WQBEL.

Based on the six samples collected and analyzed for oil and grease, the Osprey cannot currently meet the ELGs per 40 CFR 435. In order to meet the oil and grease limits, the Osprey will need increased treatment of the produced water prior to discharge.

3.3.9 Whole Effluent Toxicity Characteristics

To assess the combined effects of the pollutants in the produced water, as part of the application, DEC also requested a chronic WET test be conducted on the produced water at the Osprey Platform. The sample, collected on September 7, 2017, had a maximum reported chronic WET toxicity of 63.29 TUc based on the inhibition concentration with an estimated 25% reduction in response compared to the control (or IC_{25}).

4.0 COMPLIANCE HISTORY

Compliance with the conditions of previous APDES permits in effect for the Osprey Platform were evaluated from the time period between October 1, 2013 and March 30, 2018. Submittal of discharge monitoring reports (DMRs) are required monthly as a condition in all APDES permits. During the review period, the submittal method for DMRs transitioned from paper to electronic. The transition to electronic reporting per the EPA Electronic Reporting (eReporting) Rule (40 CFR 127) was initiated in December of 2016 for DMRs, and has been progressing in phases. The eReporting Rule also authorized NPDES programs delegated to States, including Alaska, to begin sharing DMR data electronically with EPA via the Integrated Compliance Information System (ICIS) database starting in December of 2016. During permit development, DEC also conducted a review of reported violations in the ICIS database.

4.1 Reporting and Schedule Non-compliances

There were no reporting or schedule non-compliance identified through the ICIS database during the review period.

4.2 Effluent Limit Exceedances

There were no effluent limit exceedances identified during the review period.

4.3 Inspection Non-compliances and Enforcement Actions

During the period of review, DEC performed an APDES compliance inspection of the Osprey Platform on September 1, 2016. The inspector noted failures to maintain records regarding management practices and what appeared to be a lack of pH sampling on the fire control system water discharge (008), which is considered a monitoring non-compliance. However, upon further investigation, it was determined that the permittee had in fact been monitoring pH as required, but that the DMR form lacked a field for reporting pH monitoring results. Therefore the records of the pH monitoring were not submitted on the DMRs.

The Department sent a Compliance Letter to the permittee in October 12, 2016 describing all non-compliances and noted areas of concern identified during the inspection. Based on the information provided by the permittee in a response letter to the Department dated January 11, 2017, the recordkeeping non-compliances and all areas of concern noted during the inspection were adequately addressed by the permittee.

5.0 RECEIVING WATERBODY

5.1 Water Quality Standards

Section 301(b)(1)(C) of the CWA requires the development of limits in permits necessary to meet water quality standards by July 1, 1977. Per 18 AAC 83.435, APDES permits must include conditions to ensure compliance with 18 AAC 70 –WQS. The WQS are composed of waterbody use classifications, numeric and/or narrative water quality criteria, and an Antidegradation Policy. The use classification system designates the beneficial uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each waterbody. The Antidegradation Policy ensures that the beneficial uses and existing water quality are maintained.

The receiving waters covered by the Permit are marine waters of the US located in the State of Alaska. Marine waters are classified per 18 AAC 70.020(a)(2) as Classes (2)(A), (B), (C), and (D) for use in aquaculture, seafood processing, industrial water supply, contact and secondary recreation, growth and propagation of fish, shellfish, other aquatic life, and wildlife and harvesting for consumption of raw mollusks or other raw aquatic life. The Department has determined that all of the marine use classes must be protected in state waters in Cook Inlet.

Waterbodies in Alaska are designated for all uses unless the water has been reclassified under

18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska can also have site–specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). The Department has determined that there has been no reclassification nor has site-specific water quality criteria been established for Cook Inlet at the location of the permitted discharges. Accordingly, site-specific criteria is not applicable.

5.2 Water Quality Status of Receiving Water

Any part of a waterbody for which the water quality does not, or is not expected to, intrinsically meet applicable WQS is defined as a "water quality limited segment" and placed on the state's impaired waterbody list. For an impaired waterbody, Section 303(d) of the CWA requires states to develop a Total Maximum Daily Load (TMDL) management plan for the waterbody. The TMDL documents the amount of a pollutant a waterbody can assimilate without violating WQS and allocates that load to known point sources and nonpoint sources.

Cook Inlet is not included as an impaired waterbody in the *Final Alaska 2010 Integrated Water Quality Monitoring and Assessment Report*, July 15, 2010 nor is it listed as a CWA 303(d) waterbody requiring a TMDL. Accordingly, a TMDL has not been established for Cook Inlet.

5.3 Mixing Zone Analysis

Per 18 AAC 70.240 – 70.270, as amended through June 23, 2003, the Department may authorize mixing zone(s) in an APDES permit. Determination of mixing zones requires an evaluation of critical characteristics of the receiving water, effluent discharges and other pertinent factors, combined with use of an approved mixing zone modeling program such as the Cornell Mixing Zone Model (CORMIX) or Visual Plumes.

The Permit application provides information required to verify compliance with this section and the Mixing Zone Analysis Checklist (Appendix D). The Mixing Zone Analysis Checklist outlines the criteria that must be considered and met per mixing zone regulations for the Department to authorize a mixing zone. These criteria include the size of the mixing zone, treatment technology, existing uses of the waterbody, human consumption, spawning areas, human health, aquatic life, and endangered species. The following summarizes the Department findings of the regulatory mixing zone analyses.

5.3.1 Mixing Zone Analysis by Discharge

Per 18 AAC 70.255, the Department has determined that the authorized mixing zone sizes for the discharges listed in this section are appropriate based on comparison to empirical mixing zone studies and confirmation modeling of critical ambient and effluent conditions that meet mixing zone regulatory requirements. To ensure the discharge will not exceed the criteria of 1.0 TUc at the boundary per 18 AAC 70.030, the Department authorizes a standard 100 m mixing zone for discharges where the use of chemicals are not prohibited because such use could impart chronic toxicity above 1.0 TUc at the

point of discharge. These 100 m standard mixing zones based on the Continental Outer Stratigraphic Test Well Study (COST Study) completed in 1976. The conditions from the COST Study were verified to be applicable to the Osprey Platform. Verification included comparison of critical currents from the COST sites and the Osprey Platform and confirmation modeling. The thermal discharge from noncontact cooling water was also verified by modeling to ensure water quality criteria for temperature prior to the boundary of the 100 m mixing zone sized for chronic toxicity. The following sections provide the mixing zone sizing methodology per discharge category.

5.3.1.1 **Discharge 004 – Graywater**

DEC authorizes a standard 35-meter radius chronic and an 18-meter radius acute cylindrically-shaped mixing zone extending from the sea surface to the seafloor based on TRC that could remain in the effluent from the potable water source (i.e., there are no anticipated chlorine additions). Based on the assumption that TRC is 1 mg/L in the discharge, the authorized dilution factors are 133 for the chronic and 77 for the acute.

5.3.1.2 **Miscellaneous Discharges 005, 007, 008, 009, 012, 013 and 014**

The analysis of facility-specific mixing zones led to development of a new standardized mixing zone approach for the Cook Inlet oil and gas facilities that is also applicable to the Osprey Platform. The standardized mixing zone is 100 meters radius extending from the sea surface to the seafloor and applies to either direct surface discharges or submerged discharges. The model results using various flow rates for dilution resulted in a prediction curve with a high coefficient of correlation and is used to authorize dilution factors for a standardized 100 meter radii chronic mixing zone based on highest flow rate among the miscellaneous discharges provided in the application. For the Osprey Platform, the highest flow rate was for noncontact cooling water of 1.89 mgd and a submerged outfall. For a submerged outfall, the governing equation to determine the chronic dilution factor for a 100 meter mixing zone is:

$$DF_c = 73.67 \times Flow^{-0.325} \qquad R^2 = 0.997$$

Using noncontact cooling water as the controlling discharge, DEC authorizes a standardized 100 m radius chronic mixing zone extending from the seafloor to the sea surface with an authorized a dilution factor of 127 for chronic toxicity. The mixing zone applies to all miscellaneous discharges authorized by the Permit.

5.3.1.3 **Discharge 015 – Produced Water**

Based on evaluation of recent data described in Section 3.3.8.1, the driving parameters for both the chronic mixing zone and acute mixing zone is copper. Based on meeting water quality criteria for these driving parameters at the boundary of their respective mixing zone boundary, DEC authorizes rectangular acute and chronic mixing zones that extend from the sea surface to the seafloor centered on the diffuser and aligned according to prevailing current directions evaluated using nearby NOAA stations. The dimensions of the chronic mixing zone shown in Figure are 1,060 meters long (530 meters each current direction) by 348 meters wide. The width of the chronic mixing zone was determined by examining the applicable range of current direction representing the 10th percentile current at the intersection of the length direction. The dimensions of the acute mixing zone (not shown) are 13 meters long by 13 meters wide centered on the diffuser and aligned the same as the chronic mixing zone. The authorized chronic dilution factor is 800 and the acute is 40.

5.3.2 Regulatory Size Constraints

Per 18 AAC 70.240(a)(2)[2003], mixing zones must be as small as practicable and per 18 AAC 70.245 [2003], the Department will ensure that existing uses of the waterbody outside the mixing zones are maintained and fully protected. Per 18 AAC 70.255(e)(1)(A), for estuarine and marine waters, measured at mean lower low water level (MLLW) the cumulative linear length for all mixing zones intersected on any given cross section of an estuary, inlet, cove, channel, or other marine water may not exceed 10 % of the total length of that cross section. Additionally, per 18 AAC 70.240(e)(1)(B), the total horizontal area allocated to all mixing zones may not exceed 10 % of the surface area. DEC conservatively estimated the width of Cook Inlet in the vicinity of the Osprey Platform to be the narrowest dimension of Cook Inlet, approximately 9 miles, or 14,484 m between the East and West Forelands. Given that the largest of the mixing zones to be authorized under the Permit would encompass other mixing zones of the Permit, the dimension the chronic mixing zone for Discharge 015, produced water, was evaluated for compliance with the regulatory size constraints. The longest dimension of mixing zone of Discharge 015 is 530 m, therefore the longest dimension of the chronic mixing zone is approximately 3.7 % of the minimum cross channel width. Comparison of the chronic mixing zone surface area (464,280 m^2) to the overall area of Cook Inlet at MLLW, 18,924 km^2 (Zimmerman et al, 2014) or 18,924 x 10^6 m^2, indicates the area of this mixing zone is less than 0.0025% of the overall surface area of the waterbody. Therefore the area of the mixing zone is significantly smaller than the area allowed by 18 AAC 70.240(e)(1)(B).

Per 18 AAC 70.255(b)(1), acute mixing zones must be sized so there will be no reasonable expectation of lethality to passing organisms in the mixing zone. DEC begins the evaluation of potential lethality to passing organisms by calculating the exposure time required for drifting organisms to pass through the mixing zone during 10-percentile current conditions. DEC views results showing that organisms spend less than 15 minutes in the mixing zone as indicating no reasonable expectation of lethality while results of greater than 15 minutes exposure undergo additional evaluation before making a determination.

For the produced water (Discharge 015) mixing zone, the exposure time is calculated by dividing the length of the acute mixing zone (13 m) by the 10^{th} percentile current (0.3 m/s). For these conditions, the calculation indicates an organism would spend approximately 43 seconds in the mixing zone during low current conditions. Therefore, based on the short exposure time, DEC determinations that there is no reasonable expectation of a lethality risk for an organism passing through the mixing zone. Per 18 AAC 70.240(a)(2), the Department finds that available evidence reasonably demonstrate the mixing zones have been sized to be as small as practicable.

5.3.3 Technology

18 AAC 70.240(a)(3) requires the Department to determine if "an effluent or substance will be treated to remove, reduce, and disperse pollutants, using methods found by the Department to be the most effective and technologically and economically feasible, consistent with the highest statutory and regulatory treatment requirements" before authorizing a mixing zone. Applicable "highest statutory and regulatory requirements" are defined in 18 AAC 70.990(30) [2003]. Accordingly, there are three parts to the definition, which are:

- Any federal TBEL identified in 40 CFR 125.3 and 40 CFR 122.29, as amended through August 15, 1997, adopted by reference;
- Minimum treatment standards in 18 AAC 72.040; and
- Any treatment requirement imposed under another state law that is more stringent than the requirement of this chapter.

The first part of the definition includes all TBELs based on federal Effluent Limitation Guidelines (ELGs) adopted by reference at 18 AAC 83.010(g)(3) or TBELs developed using case-by-case BPJ. DEC is relying on the ELGs for the Oil and Gas Extraction Point Source Category at 40 CFR Part 435 Subpart D [Coastal Subcategory adopted by reference at 18 AAC 83.010(g)(3)]. For this permit, these ELGs are applicable to the discharges of deck drainage, graywater, and produced water. The ELG for deck drainage (Discharge 002) requires no discharge of free oil as determined by the Static Sheet Test. The ELG for graywater (Discharge 004) requires no floating solids, foam, or garbage. The ELGs for produced water establish for oil and grease an MDL of 42 mg/L and an AML of 29 mg/L.

Where EPA has not yet developed ELGs, permitting authorities can establish TBELs using case-by-case BPJ. The Permit establishes a maximum daily limit for TRC of 1.0 mg/L for applicable discharges using case-by-case BPJ because the Department considers dechlorination an effective and both technologically and economically feasible treatment to attain this limit. For discharges of desalination waste (005), noncontact cooling water (009), and waterflooding (014) the Department has imposed chemical dosing restrictions and stringent source control measures (e.g., Pollution Reduction BMPs). The combination of TBELs and source control through BMPs is the most effective and technologically and economically feasible methods to control the pollutant discharges and represent the highest statutory and regulatory requirements.

The second part of the definition from the WQS appears to be in error, as 18 AAC 72.040 considers discharge of sewage to sewers and not minimum treatment. The correct reference appears to be 18 AAC 72.050, minimum treatment for domestic wastewater. Graywater is domestic wastewater that requires at least primary treatment and a waiver to secondary treatment (18 AAC 72.060) to be discharged under the Permit. The permittee has primary treatment to remove BOD_5 and TSS but has not yet obtained a waiver for secondary treatment like other Cook Inlet oil and gas facilities. Also similar to other Cook Inlet oil and gas facilities, the permittee is allowed to continue to discharge graywater under the Permit while characterizing the effluent and submitting a report to DEC during the term of the Permit. Hence, the Permit includes a mechanism for the permittee to achieve compliance with 18 AAC 72. Accordingly, the intent of the second part of the definition has been met.

The third part of the definition includes any treatment required by state law that is more stringent than 18 AAC 70. Other regulations beyond 18 AAC 70 that may apply to this permitting action include 18 AAC 83, 18 AAC 72 and 18 AAC 15. The Permit limitations, prohibitions, and BMP requirements are consistent with both 18 AAC 83 and 18 AAC 70. The application of minimum treatment standards in 18 AAC 72 is discussed in the preceding paragraph. Neither the regulations in 18 AAC 15 nor another state legal requirement that the Department is aware of impose more stringent treatment requirements than 18 AAC 70 other than 18 AAC 72. Therefore, the third and final part of the definition has also been met.

5.3.4 **Existing Use**

Per 18 AAC 70.245, when determining the appropriate size of mixing zones, the Department must ensure that the existing uses of the waterbody outside the mixing zone are not partially nor completely eliminated and the overall biological integrity of the waterbody as whole is not impaired. Water quality criteria are specifically developed to ensure the existing uses and biological integrity of the waterbody as a whole are protected. Therefore, if the water quality criteria are met in the waterbody, then the existing uses are protected. Given that all authorized mixing zones have been sized to ensure all water quality criteria will be met at, and beyond, the boundary of the chronic mixing zone, the existing uses of the waterbody as a whole will be maintained and fully protected under the terms of the Permit as required in

18 AAC 70.245 (a)(1) and (a)(2). Therefore, the mixing zones results in the protection of the existing uses of the waterbody as a whole.

5.3.5 Human Consumption

Per 18 AAC 70.250(b)(2) and (b)(3), the subject pollutants will not produce objectionable color, taste, or odor in aquatic resources harvested for human consumption, nor will the discharges preclude or limit established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. Compliance with permit conditions will regulate discharge of pollutant concentrations so that the discharges will not produce objectionable color, taste, or odor in aquatic resources.

5.3.6 Spawning Areas

Per 18 AAC 70.255(h), a mixing zone is not authorized in an area of anadromous fish spawning or resident fish spawning redds for Arctic grayling, northern pike, rainbow trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked Coho, king, and sockeye salmon. The Permit does not authorize the discharge of effluent to open waters of a freshwater lakes or rivers. Therefore, there are no associated discharges to anadromous fish or the resident freshwater fish spawning areas listed in the regulation.

5.3.7 Human Health

Per 18 AAC 70.250(a)(1), 18 AAC 70.255(b) and (c), and 18 AAC 70.255(e)(3)(B) the mixing zones will not result in pollutants discharged at levels that will bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota, or at levels that otherwise will create a public health hazard through encroachment on a water supply or contact recreation uses. The Department has reviewed currently available data that reasonably demonstrates bioaccumulation or bioconcentration is not occurring as a result of discharges authorized by the Permit. During the last permit cycle, sediment and water column studies were conducted to assess persistence of pollutants in the discharge associated with produced water and documented in the Produced Water Study (PWS) Report. The data collected is also pertinent to the discharge of drilling fluids and drill cuttings. Cook Inlet, is a very dynamic waterbody and constantly changing tidal velocities and directions cause a continuous reworking and scouring of fine-grained sediments in the vicinity of the discharge. The resulting bottom sediments in the mixing zone area are typically characterized as sands, gravels, and cobbles with minor fractions of silt and clay (0.6 to 1.2 %). Analysis of metals and hydrocarbons in these sediments indicate concentrations are well below published criteria (Long, 1993) and are indistinguishable from background sediment concentrations (Kent and Sullivan, 2005). When coarse-grained sediment is beneath the mixing zone, the propagation of shellfish or other benthic species are not expected to exist so are not considered to be a receptor for bioaccumulative pollutants at these locations.

The PWS Report developed under the 2007 GP indicated discharges related to oil and gas activities are not resulting in persistence in the environment. Major conclusions derived from these works include, but are not limited to:

- Concentrations of barium, cadmium, chromium, copper, nickel, lead, and zinc for bottom sediments in Cook Inlet were at background values at all 55 sampling stations.
- Concentrations of arsenic, manganese and selenium for bottom sediments in Cook Inlet were above background values at a few locations but could be caused by natural changes of rock and sediments.

- Concentrations of many metals in bottom sediments were below sediment quality guidelines that evaluate effects to bottom dwelling test organisms. (Note: Although Alaska WQS do not include specific sediment quality standards, these types of tests help to evaluate whether metals in the water column are concentrating at levels in sediments that can impact aquatic organisms directly or through the food web.)
- Mercury concentrations for bottom sediments in Cook Inlet were above background at 10 of 55 locations, including five in Kachemak Bay. (Note: Global sources of mercury discharges, including aerial deposition from combustion sources, impact waterbodies world-wide. The 2007 GP and the Permit prohibit discharges into Kachemak Bay.)
- Concentrations of dissolved metals in marine waters were comparable to background and no elevations of dissolved metals from produced water could be identified.
- Concentrations of dissolved metals in Cook Inlet rivers were variable and probably a function of both natural and man-induced sources.

Data on persistence in biota has been review for species at several trophic levels including fish, sea otters, and beluga whale. As described in the 2009 ATSDR, Health Consultation Study, contaminant concentrations detected in fish in Cook Inlet are similar to those in fish collected throughout Alaska (ATSDR 2009). The Alaska Department of Health and Social Services, Division of Public Health recommends that the majority of Alaskans continue unrestricted consumption of all fish from Alaskan waters, including those from Cook Inlet (DHSS 2007 and 2014). Contaminant levels in marine mammals have been reviewed, focusing on Sea Otters, Stellar Sea Lions, and Beluga Whales. The 2013 Recovery Plan for Sea Otters developed by the U.S. Fish and Wildlife Service (FWS) notes that "heavy metals are unlikely to be a casual factor in the decline" in sea otter populations in and around the Cook Inlet. Similarly, the 2008 Stellar Sea Lion recovery plan does not include oil and gas activities or related discharges as a threat to the population. The concentration of contaminants found in Cook Inlet Beluga Whales were lower than in other surveyed Alaskan beluga stocks, and the Cook Inlet population was actually healthier than most other national and international populations (Becker et al. 2000; Lebeuf et al. 2004; NFMS 2008a; Becker 2009; DFO 2012, Reiner et al. 2011; Wetzel et al.2010; Hoget et al. 2013). The comparatively low levels of contaminants documented in Cook Inlet belugas themselves as well as the low levels of contaminants in Cook Inlet water and sediment suggests the relative concern of contaminants, including those from oil and gas discharges, is low (NOAA 2016).

Per 18 AAC 70.250 and 18 AAC 70.255, the mixing zones authorized by the Permit shall be protective of human health. An analysis of available information reasonably demonstrates that the authorized mixing zone will protect human health. Per 18 AAC 70.255(c), human health criteria must be met at the boundary of the chronic mixing zone. Unlike aquatic life criteria that have short exposure periods, human health criteria are based on much longer exposure periods (e.g., lifetime exposure). Therefore, when assessing human health criteria at the boundary of the chronic mixing zone, it is appropriate to consider average effluent and receiving water conditions commensurate with the long exposure periods for which the human health criteria are based. To illustrate this point, the Department considered the low, long-term average concentration of mercury in the mixing zone during the modeling efforts to derive the required dilution factor and distance to meeting the human health criteria. Mercury was selected as the surrogate because the criteria is most stringent, 0.051 µg/L, among the human health POCs authorized in the mixing zones. As an example, the dilution factor needed to meet all chronic criteria for produced water is 800; whereas, the dilution factor needed to meet human health criteria for mercury is less than 1. Hence, human health criteria is met at the point of discharge indicating there is no exposure in the receiving for concentrations greater than the existing mercury human health criteria.

5.3.8 Aquatic Life and Wildlife

Per 18 AAC 70.255(b)(1) and (2), 18 AAC 70.250(b)(1), or 18 AAC 70.250(a)(2)(A-C) pollutants for which the mixing zones will be authorized will not result in concentrations outside of the mixing zone that are undesirable, present a nuisance to aquatic life, result in permanent or irreparable displacement of indigenous organisms, or a reduction in fish or shellfish population levels. Mixing zone authorizations result in water quality criteria being met at the boundary of the chronic mixing zones for all POCs. For domestic wastewater and graywater, establishing a 1 mg/L maximum daily limit for TRC for all facilities ensures the chronic life criteria is met at the chronic mixing zone boundary. For noncontract cooling water discharges involving sea water intermittently treated with chemicals, mixing zone authorizations for chronic WET are also contingent on chronic toxicity criteria being met at the boundary of the mixing zone. Coupled with the requirement for permittees to inventory chemical additives used to treat seawater, the Department determined WET monitoring coupled with PR BMP Revision Action Levels will ensure protection of aquatic life and indigenous organisms outside the mixing zone. The chronic mixing zone for produced water have been developed based on meeting stringent criteria for TAH at the boundary of facility-specific mixing zones to ensure protection of aquatic life beyond the boundary. New information and conservative modeling approaches have resulted in better assurance that criteria will be met at the boundary. The Department concludes that the discharges will meet all water quality criteria at and beyond the authorized mixing zone boundaries.

5.3.9 Endangered Species

Per 18 AAC 70.250(a)(2)(D), the mixing zone is not expected to cause an adverse effect on threatened or endangered species. Impacts to overall water quality, and any threatened or endangered species therein, are not expected based on the discharge characteristics and the rapid mixing associated with the extreme tidal fluctuations in the receiving water. The National Marine Fisheries Service (NMFS) and the FWS indicated that there are two listed endangered species in Cook Inlet in the vicinity of the discharge: Cook Inlet Beluga Whale (*Delphinapterus leucas*) and Short-Tailed Albatross (*Phoebastria [=Diomedea] albatrus*). See Section 11.1 for more information on endangered species.

6.0 EFFLUENT LIMIT DEVELOPMENT

6.1 Basis for Effluent Limits

Per 18 AAC 83.015, the Department prohibits the discharge of pollutants to waters of the U.S. unless the applicant has first obtained an APDES permit that meets the purposes of AS 46.03 and is in accordance with CWA Section 402. Per these statutory and regulatory provisions, the Permit includes effluent limits that require the discharger to meet standards reflecting levels of technological capability, comply with WQS, and comply with other state requirements that may be more stringent.

The CWA requires that the limits for a particular pollutant be the more stringent of either TBELs or WQBELs. TBELs are set via EPA-rule makings in the form of ELGs and correspond to the level of treatment that is achievable using available technology. In establishing permit limits, DEC first determines which TBELs must be incorporated into the Permit. The applicable ELG TBEL requirements for the Permit are from 40 CFR 435 Subparts A and D, for the offshore and coastal applications. If exceedances could occur, water quality-based effluent limits (WQBELs) must be included in the Permit.

The limits in the Permit reflect whichever requirements (technology-based or water quality-based) are more stringent. The Permit contains TBELs per 40 CFR 435, TBELs developed using best BPJ, and WQBELs.

Table **2** lists each discharge for the facility, and the basis of each associated effluent limit.

Table 2**: Summary of Basis of Limits by Discharge Category**

Discharge (Number)	TBELs		WQBELs
	ELGs	BPJ	
Deck Drainage (002)	No Free Oil (Static Sheen)	---	Oil & Grease (Visible Sheen)
Graywater (004)	No Floating Solids, Foam, or Garbage	---	Oil & Grease (Visible Sheen)
Miscellaneous Discharges Excess Cement Slurry (012) Fluids, Cuttings & Cement at the Seafloor (013)	---	---	Oil & Grease (Visible Sheen)
Produced Water (015)	Oil & Grease MDL 42 mg/L and AML 29 mg/L	6.0 < pH < 9.0	Oil & Grease (Visible Sheen)

7.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

In accordance with AS 46.03.110(d), the Department may specify the terms and conditions for discharging wastewater in a permit. Per 18 AAC 83.455, APDES permits must include monitoring to determine compliance with effluent limits. Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor facility performance.

The Permit includes monitoring requirements so that compliance with effluent limits can be determined, but may also be required to characterize the effluent and to assess impacts to the receiving water. Sufficiently sensitive methods as required in 40 CFR 136 are required for analyzing collected samples. The permittee must report all violations of MDLs per Appendix A, Standard Conditions, Section 3.4 – 24-Hour Reporting. Violations of all other effluent limits are to be reported per Appendix A, Standard Conditions, Section 3.5 – Other Noncompliance Reporting.

7.1 Effluent Limits and Monitoring Requirements for Deck Drainage (002)

Effluent limits and monitoring requirements for Discharge 002 – Deck Drainage are summarized in Table 3.

Table 3: Effluent Limits and Monitoring Requirements for Deck Drainage (002)

Parameter (Units)	Effluent Limitations	Monitoring Requirements	
		Frequency	Type
Volume (mg) [7.1.1]	Report	Daily	Estimated
Free Oil [7.1.2]	No Discharge	Daily	Visual

7.1.1 Total Flow Volume

The Permit requires effluent discharge volume to be measured or estimated daily when discharging and recorded in a log maintained at the facility that will be made available to DEC upon request. The total estimated monthly volume must be reported on the DMR.

7.1.2 No Free Oil

The permittee must ensure that deck drainage contaminated with oil and grease is processed through an oil-water separator, or other oil removal process, prior to discharge. Daily while discharging, the permittee must observe the receiving water surface while discharging during a time when observation of the water surface is possible and record observations in a daily log maintained at the facility that will be made available to DEC upon request. If conditions prevent observations, the permittee may use the Static Sheen Test (EPA Method 1617). Static Sheen Test equipment must be maintained onsite.

7.2 Effluent Limits and Monitoring Requirements for Graywater (004)

The permittee must limit and monitor graywater discharges per Table 4.

Table 4: Effluent Limits and Monitoring Requirements for Graywater (004)

Parameter (Unit)	Effluent Limitations	Monitoring Requirements	
		Frequency	Type
Total Flow Volume (mg) [7.2.1]	Report	Daily	Estimate or Measured
Floating solids, foam, & garbage [7.2.2]	No Discharge	Daily	Observation
Oil and grease (visible sheen) [7.2.3]	No Discharge	Daily	Observation

7.2.1 Flow

The Permit requires effluent flow volume to be to measured or estimated for each month a discharge occurs with the total estimated monthly volume must be reported on the DMR.

7.2.2 Floating Solids, Foam, and Garbage

The Permit prohibits floating solids, foam, and garbage and requires a visual observation of the receiving water surface at a minimum frequency of once per day during daylight at the time of maximum estimated discharge (e.g., following morning or midday meals). Observations must be recorded in a daily operating log and made available upon request by DEC.

7.2.3 Oil and Grease (Visible Sheen)

The Permit prohibits the discharge of oil and grease as determined by a visible sheen on the receiving water surface per 18 AAC 70.020(17). Receiving water observations must be conducted once per day during daylight at the time of maximum estimated discharge (e.g., following morning or midday meals). Observations must be recorded in a daily operating log and made available upon request by DEC. To

support this narrative limit, the permittee must develop specific housekeeping BMPs to minimize introduction of oil and grease at the source.

7.3 Effluent Limits and Monitoring Requirements for Miscellaneous Discharges (005, 007, 008, 009, 010, 012, 013 and 014)

The monitoring and reporting requirements listed in the Table 5 apply to the specified miscellaneous discharges. These discharges include desalination unit wastes (Discharge 005), boiler blowdown (007), fire control system test water (008), noncontact cooling water (009), excess cement slurry (012), and fluids, cuttings, and cement at the seafloor (013), and waterflooding wastewater (014). The permittee must comply with the effluent limitations and monitoring requirements for miscellaneous discharges in Table 5.

Table 5: Effluent Limits and Monitoring for Miscellaneous Discharges (005, 006, 007, 008, 009, 010, 012, 013)

Parameter (Units)	Limits	Monitoring Requirements	
		Frequency	Type
Maximum Daily Flow (mgd) 7.3.1	Report	Daily	Measure or Estimate
Oil and Grease (Sheen) **Error! Reference source not found.**	No Discharge	Daily	Visual
Chronic WET 7.3.5, 7.3.5and 7.5	Report	Twice/Year	Grab

7.3.1 Flow

The Permit requires the average flow and maximum daily effluent flow for a given month to be to measured, or estimated, and reported on the DMR. Daily flow measurement must be conducted on a consistent basis (approximately at the same time daily) and recorded in a log and made available to DEC upon request. For desalination waste (005), noncontact cooling water (009), or waterflooding (014) if chemicals have been added and the 24-hour flow volume is greater than 10,000 gpd or 0.010 mgd, the permittee must conduct chronic WET monitoring by collecting a grab sample that is representative of the chemically treated effluent per Section 7.3.5 and 7.3.4 and conduct a chemical inventory per Section 7.3.3.

7.3.2 Oil and Grease (Sheen)

The prohibition of oil and grease (sheen) applies to excess cement slurry (012) and fluids, cuttings, and cement at the seafloor (013) based on daily observation of a visible sheen on the water surface during slack tide while discharging. Compliance with the oil and grease visual sheen can be done by Static Sheen Test at the permittee's option. For discharges of excess cement slurry and fluids, cuttings and cement at the seafloor the permittee must develop specific BMPs to support the no oil and grease visual limitation.

7.3.3 Chemical Use Optimization and Inventory

The permittee is allowed to use chemical additives in miscellaneous discharges in a manner that does not exceed the most stringent of the following four constraints:

a) The maximum concentrations, and any other conditions specified in the EPA product registration labeling, if the chemical is an EPA registered chemical;
b) The maximum manufacturer's recommended concentration;

c) 500 mg/L; or
d) The estimated chronic toxicity based on the mixed concentration of each individual chemical in the waste stream should not be greater than Pollution Reduction Action Level for Discharges 005 - Desalination Waste, 009 - Noncontact Cooling Water, and 014 - Waterflooding. The chronic toxicity estimate can be based on the most limiting 25 % effect concentration (EC25) listed from the aquatic toxicological information obtained in the SDS for the chemical, if available. Note that when only acute toxicity data is provided on an SDS, the permittee must use a reported acute to chronic ratio (ACR) for that chemical and species, or a default ACR of 10, to estimate the TUc of the mixture. If no toxicological information is available, the chemical is not included in the estimate.

Per this Section, the permittee must also maintain an inclusive chemical inventory of all constituents added including the time, dose, and frequency of each chemical additive used and actually discharged. This requirement only pertains to desalination waste, noncontact cooling water, and waterflooding discharges. The permittee must submit these inventory records to DEC annually by January 31 of each year.

7.3.4 Specific Pollution Reduction BMPs and BMP Revision Action Levels

For the miscellaneous discharges desalination unit waste (Discharge 005), noncontact cooling water (Discharge 009), and waterflooding (Discharge 014) the permittee must develop and implement a chemical dosing BMP to optimize the use of chemicals and to minimize the potential for chronic toxicity in miscellaneous discharges per Section 10.3.1.4. This requirement applies to any individual, or commingled, discharges of desalination waste, noncontact cooling water and waterflooding that have chemical additives and discharge greater than 10,000 gpd or 0.010 mgd. In addition, the permittee must make revisions to existing BMPs should any single chronic WET result exceed the PR BMP Revision Action Levels of 127 TU_c.

If a PR BMP Revision Action Level is exceeded, the permittee must revise the BMP to achieve less toxicity in the subsequent test. These BMPs could be operational or physical modifications to the chemical dosing system and/or dechlorination system (if chlorine is used). Exceeding a PR BMP Revision Action Level also initiates a requirement for the permittee to evaluate the system and initiate an update to line drawings as part of the BMP Plan revision. Regardless of exceeding a PR BMP Revision Action Level, the permittees will be required to submit updated line drawings of the discharge piping systems with the next application for reissuance for each authorized discharge of desalination waste, noncontract cooling water, or waterflooding where chemicals are used and the discharge is greater than 10,000 gpd or 0.010 mgd. The updated line drawings will also be used to evaluate the written requests for reducing WET monitoring frequency. If the discharge of chemicals is eliminated, chronic WET testing is not required and line drawings will not be required in the application.

The permittee must notify DEC in writing within one week of obtaining chronic WET results that exceed a chronic WET PR BMP Revision Action Level and submit a letter within 60 days specifying what BMP revisions will be implemented prior to the next scheduled chronic WET monitoring event. If BMPs require modification to the physical system, updated line diagrams must be developed and submitted to DEC as an attachment to the letter. The revised BMP must be implemented to satisfy compliance with this specific BMP requirement for pollution reduction. Revisions must continue until the PR BMP Plan Action Level is achieved. Furthermore, an exceedance of a PR BMP Revision Action Level does not constitute a violation of water quality standards because the intermittent use of chemicals

will not exceed the exposure period of four days for chronic toxicity to exist in the receiving environment (See Section 3.3.7).

As an incentive to PR, if the permittee demonstrates that sampling procedures were adequate to collect a representative sample and toxicity results do not exceed PR BMP Revision Action Levels in two consecutive WET monitoring events, they can submit a written request for WET monitoring frequency reduction for written Department approval. Written requests must include updated line diagrams, a narrative of sample collection procedures used to ensure representative sampling (See Section 10.2), and cover letter describing the pollution reduction methods used to reduce chronic toxicity. Only one step reduction may be granted by DEC during the Permit term.

7.3.5 Specific Chronic WET Testing Requirements for Miscellaneous Discharges

Chronic WET monitoring applies to Desalination Units (005), Non-contact Cooling Water (009), and Waterflooding (014) if chemical additives are used and greater than 10,000 gpd (0.010 mgd) is discharged over a 24 hour period, including discharges that may be commingled and discharged accumulatively.

7.3.5.1 Test Species

For miscellaneous discharges that have chemical additives and discharge 10,000 gpd (0.010 mgd) or more in a 24 hour period, the permittee is required to conduct chronic WET monitoring on one invertebrate species on frequency established in Table 5 or in a written approval from DEC for frequency reduction per Section 7.3.4.

7.3.5.2 Monitoring Frequency

When WET monitoring is required based on the condition of chemical use and daily flow volume, the monitoring frequency is semi-annual with a minimum of 120 days between any two sample events. After two consecutive chronic WET results that are below the PR BMP Revision Action Level of 127 TU_c (See Section 7.3.4), the permittee may submit a written request to reduce the frequency to annual. Approval is also contingent upon collection of representative samples of the effluent and submittal per Section 7.3.5.3)

7.3.5.3 Sample Collection:

The permittee must evaluate chemical dosing practices versus sample collection methods and timing in order to ensure the collected sample is representative of the toxicity of the dosing. For example, for continuous discharges with continuous chemical injection rates a grab or composite sample could result in collection of a representative sample. However, if the discharge is intermittent and/or chemical dosing is discontinuous, the permittee must evaluate the timing and duration of peack concentrations in the effluent to properly time sample events to obtain a representative sample. Each facility must have a Quality Assurance Project Plan (QAPP) that specifies this procedure (See Section 10.2). Requests for chronic WET monitoring frequency reductions must include submittal requirements in Section 7.3.4 and this procedure and a narrative addressing representativeness of the sampling events.

7.4 Effluent Limits and Monitoring Requirements for Produced Water (015)

Effluent limits and monitoring requirements for Discharge 015 – Produced Water are summarized in Table 6.

Table 6: Effluent Limits and Monitoring Requirements for Produced Water (015)

Parameter	Effluent Limitations		Monitoring Requirements	
	MDL	AML	Frequency	Type
Flow Rate (mgd)	Report	1.05	l/Week	Estimate or Measure
pH (SU)	6.0 < pH < 9.0		1/Week	Grab
Oil and Grease (Sheen) [7.4.1]	Report		1/Week	Visual
Oil and Grease (mg/L)	29	42	1/Week	Grab
TAH (mg/L)	9.0	7.7	l/Week	Grab
Copper (µg/L)	195	97	l/Week	Grab
TAqH (mg/L)	Report		1/Week	Grab
Silver (µg/L)	Report		1/Quarter	Grab
Zinc (µg/L)	Report		1/Quarter	Grab
Mercury (µg/L)	Report		1/Quarter	Grab
Manganese (mg/L)	Report		1/Quarter	Grab
WET (TU_c) [7.4.2and 7.5]	Report		1/Quarter	Grab or Composite

7.4.1 Visual Sheen and Supplemental Oil and Grease Monitoring

While discharging, the permittee shall monitor for oil and grease using visual observations of the receiving water surface in the vicinity of the discharge during periods of the day when observation of a sheen on the water surface is possible. Upon observation of a sheen, a supplemental oil and grease sample must be collected and analyzed.

7.4.2 Specific Chronic WET Monitoring and Reporting Requirements for Produced Water

Per the frequency specified in Table 6, the permittee is required to conduct chronic WET monitoring for both a vertebrate and invertebrate species discussed in Sections 7.5.1.1 and 7.5.1.2, respectively. The metals required to be monitored at various frequencies must be analyzed concurrently when chronic WET samples are collected.

7.5 Chronic WET Monitoring Requirements

The permittee must conduct chronic WET testing per this section while applying discharge-specified requirements for miscellaneous discharges in Section 7.3.5 that supersedes requirements in this section for test species, sampling frequencies, and sample collection. See also Section 7.4.2 for specific chronic WET monitoring and reporting requirements for produced water.

7.5.1 Test Species and Methods

When chronic WET monitoring is required by the Permit, the permittee must conduct chronic WET testing on one vertebrate and one invertebrate species unless otherwise stated in discharge specific sections of the Permit (See Section 7.3.5.1). The permittee must conduct the WET testing to screen for the most sensitive invertebrate species in Section 7.5.1.2 once per permit term for each discharge (i.e., desalination waste, noncontract cooling water, waterflooding, and produced water). Upon identification of the most sensitive test species, the permittee may submit a written request to eliminate the less sensitive species in subsequent WET analysis for DEC written approval. DEC can also approve written requests to substitute the less sensitive species during periods when the more sensitive species is

unavailable. The permittee shall not make any changes to the selection of test species or dilution series without prior written DEC approval. The applicable species include:

7.5.1.1 Vertebrate (survival and growth) *Atherinops affinis* (topsmelt)

In the event that topsmelt is not available, *Menidia beryllina* (inland silverside) may be used as a substitute. The permittee shall document the use of substitute species in the DMR for the testing.

7.5.1.2 Invertebrate

For larval development tests, the permittee must use bivalve species *Crassostrea gigas* (Pacific Oyster) or *Mytilus spp*. (mussel) and *Americamysis bahia* (formally *Mysidopsis bahia*, mysid shrimp) for survival and growth. Due to seasonal variability, testing may be performed during reliable spawning periods (e.g., December through February for mussels and June through August for oysters).

7.5.2 Monitoring Frequency.

See discharge-specific Section 7.3.5.2 and Table 5 for miscellaneous discharge frequencies and Table 6 for produced water frequency.

7.5.3 Procedures.

The permittee must conduct chronic WET testing using the following procedures.

7.5.3.1 Methods and Endpoints

For the shrimp and alternate fish species, inland silverside, the presence of chronic toxicity must be estimated as specified in *EPA Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Third Edition* (EPA-821-R-02-014). For the bivalve species and topsmelt, chronic toxicity must be estimated as specified in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to West Coast Marine and Estuarine Organisms* (EPA/600/R-95/136). The WET testing will determine the EC_{25} endpoint estimate of the effluent concentration that would cause a 25 % reduction in normal embryo development for the bivalves or in survival for fish and/or mysid shrimp. The WET testing will also determine the inhibition concentration (IC_{25}) point estimate of the effluent concentration that would cause a 25 % reduction in the growth of the fish and/or mysid shrimp.

7.5.3.2 Reporting Results

Results must be reported on the DMR using TU_c, where $TU_c = 100/EC_{25}$ or $100/IC_{25}$. The reported EC_{25} or IC_{25} must be the lowest point estimate calculated for the applicable survival, growth or normal embryo development endpoints. The permittee must report the no observed effect concentrations (NOECs) in the full WET test report. DEC may compare this information with the IC_{25} during reissuance of the Permit.

7.5.3.3 Acute Toxicity Estimates

Although acute WET testing is not required, the permittee must provide an estimate of acute toxicity based on observations of mortality when appropriate (e.g., vertebrates). Acute toxicity estimates, if available, must be documented in the full report.

7.5.3.4 **Dilution Series**

A series of at least five dilutions and a control must be tested. The recommended initial dilution series to screen for toxicity is 0.5, 6.25, 12.5, 25, 50, and 75% (or maximum hypersaline dilution) along with a control of dilution water (0% effluent). In subsequent tests, the dilution series should be modified to bracket toxicity endpoints observed during previous tests. DEC may provide written direction to modify the previous dilution series or the permittee may request written approval from DEC to modify the dilution series based on previous test results.

7.5.3.5 **Hold Times**

WET sample holding times are established at 36 hours and samples must not exceed a hold time of 72 hours. The permittee must document the conditions that resulted in the need for the holding time to exceed 36 hours and the potential effect on the test results.

7.5.3.6 **Additional Quality Assurance Procedures**

In addition to those quality assurance measures specified in the methodology, the following quality assurance procedures must be followed:

a) If organisms are not cultured by the testing laboratory, concurrent testing with reference toxicants must be conducted, unless the test organism supplier provides control chart data from at least the previous five months of reference toxicant testing. Where organisms are cultured by the testing laboratory, monthly reference toxicant testing is sufficient.
b) If either of the reference toxicant tests or the effluent tests does not meet all test acceptability criteria as specified in the test methods manual, then the permittee shall re-sample and re-test within the following month.
c) Control and dilution water must be receiving water, or salinity adjusted lab water. If the dilution water is different from the culture water, a second control, using culture water must also be used.

7.5.3.7 **WET Reporting**

7.5.3.7.1 DMRs and Full Report Deliverables:

The permittee shall submit chronic WET test results on next month's DMR following the month of sample collection. The permittee must also submit the full WET Toxicity Report as an attachment to the DMR per Section 7.6.1

7.5.3.7.2 Full Report Preparation

The report of results shall include all relevant information outlined in Section 10 of Report Preparation in the U.S. EPA Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Third Edition (EPA-821-R-02-014).

7.5.3.8 **Additional Reporting Information**

In addition to toxicity test results, the permittee shall report:

a) The date and time of sample collection and initiation of each test,
b) The discharge flow rate at the time of sample collection, and
c) A list of corrosion inhibitors, biocides, algaecides, clarifying agents, or other additives being used by facility that could potentially be in the effluent during the 30-day period preceding sampling.

7.6 Electronic Discharge Monitoring Reports

7.6.1 E-Reporting Rule, Phase I (DMRs)

The permittee must submit a DMR for each month by the 28th day of the following month. DMRs shall be submitted electronically through NetDMR per Phase I of the E-Reporting Rule (40 CFR 127). Authorized persons may access permit information by logging into the NetDMR Portal at https://cdxnodengn.epa.gov/oeca-netdmr-web/action/login. DMRs submitted in compliance with the E-Reporting Rule are not required to be submitted as described in Permit Appendix A – Standard Conditions unless requested or approved by the Department. Any DMR data required by the Permit that cannot be reported in a NetDMR field (e.g. full WET reports, mixing zone receiving water data, etc.), shall be included as an attachment to the NetDMR submittal. DEC has established an e-Reporting Information website at http://dec.alaska.gov/water/Compliance/EReportingRule.htm that contains general information about this new reporting format. Training materials and webinars for NetDMR can be found at https://netdmr.zendesk.com/home.

7.6.2 E-Reporting Rule, Phase II (Other Reports)

Phase II of the E-Reporting Rule specifies that permittees will integrate electronic reporting for all other reports required by the Permit (e.g., Annual Reports and Certifications) and implementation is expected to begin during the term of the Permit. Permittees should monitor DEC's E-Reporting website at http://dec.alaska.gov/water/Compliance/EReportingRule.htm for updates on Phase II of the E-Reporting Rule and will be notified when they must begin submitting all other reports electronically. Until such time, other reports required by the Permit may be submitted in accordance with Permit Appendix A – Standard Conditions.

7.7 Additional Monitoring

DEC may require additional monitoring of effluent or receiving water for facility or site-specific purposes, including, but not limited to: data to support NOI or applications, demonstration of water quality protection, obtaining data to evaluate ambient water quality, evaluating causes of elevated concentrations of parameters in the effluent, and conducting chronic WET toxicity identification and reduction. If additional monitoring is required, DEC will provide the permittee or applicant the request in writing.

A permittee has the option of taking more frequent samples than are required under the Permit. These samples must be used for averaging if they are conducted using approved test methods as found in 40 CFR Part 136, adopted by reference at 18 AAC 83.010(f). Monitoring may also be required to gather data for future effluent limits or to monitor effluent impacts on receiving water quality. Analytical methods for studies must use the most sensitive methods. The results of any additional monitoring must be included in the calculation and reporting of the data on DMRs as required by the Permit and Standard Conditions Part 3.2 and 3.3 (Permit Appendix A).

Monitoring for effluent limitations must use methods with method detection limits that are less than the effluent limitations or are sufficiently sensitive. Monitoring effluent or receiving water for the purpose of comparing to water quality criteria must use methods that are less than the applicable criteria or are sufficiently sensitive. Per 40 CFR 122.21(a)(3), a method approved under 40 CFR 136 is sufficiently sensitive when:

(A) The method minimum level (ML) is at or below the level of the applicable water quality criterion for the measured parameter, or

(B) The method ML is above the applicable water quality criterion, but the amount of the pollutant or pollutant parameter in the discharge is high enough that the method detects and quantifies the level of the pollutant or pollutant parameter in the discharge (e.g., not applicable to effluent or receiving water monitored for characterization), or

(C) The method has the lowest ML of the analytical methods approved under 40 CFR 136 for the measured pollutant or pollutant parameter (e.g., the receiving water concentration or the criteria for a given pollutant or pollutant parameter is at or near the method with the lowest ML).

8.0 ANTIBACKSLIDING

Per 18 AAC 83.480, a reissued permit requires that "…effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit." 18 AAC 83.480(c) also states that a permit may not be reissued "to contain an effluent limitation that is less stringent than required by ELGs in effect at the time the Permit is renewed or reissued."

Effluent limitations may be relaxed as allowed under 18 AAC 83.480(b), CWA Section 402(o) and CWA Section 303(d)(4). 18 AAC 83.480(b) allows relaxed limitations in renewed, reissued, or modified permits when there have been material and substantial alterations or additions to the permitted facility that justify the relaxation, or, if the Department determines that technical mistakes were made.

CWA Section 303(d)(4)(A) states that, for waterbodies where the water quality does not meet applicable WQS, effluent limitations may be revised under two conditions, the revised effluent limitation must ensure the attainment of the WQS (based on the waterbody TMDL or the waste load allocation) or the designated use which is not being attained is removed in accordance with the WQS regulations.

CWA Section 303(d)(4)(B) states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the State's Antidegradation Policy. Even if the requirements of CWA Section 303(d)(4) or 18 AAC 83.480(b) are satisfied, 18 AAC 83.480(c) prohibits relaxed limits that would result in violations of WQS or, where applicable, ELGs.

State regulation 18 AAC 83.480(b) only applies to effluent limitations established on the basis of CWA Section 402(a)(1)(B), and modification of such limitations based on effluent guidelines that were issued under CWA Section 304(b). Accordingly, 18 AAC 83.480(b) applies to the relaxation of previously established case-by-case TBELs developed using BPJ. To determine if backsliding is allowable, the regulation provides five regulatory criteria in 18 AAC 83.480(b)(1-5) that must be evaluated and satisfied.

All effluent limitations, standards, and conditions in the Permit are as stringent, or more stringent, than those in the 2009 Permit except for accelerated testing requirements for chronic WET monitoring on produced water discharges and Toxicity Reduction Evaluations (TRE) and Toxicity Identification Evaluations (TIE). The removal of accelerated testing, TRE, and TIE requirements is based on critical evaluation of the objective of obtaining sufficient data for characterizing effluent and incentivizing PR strategies, which is intended to reduce or eliminate pollutants in the discharge. As structured in the 2009 Permit, the accelerated testing, TRE, and TIE were not based on an authorized mixing zone for miscellaneous discharges. The triggers in the 2009 GP were based on meeting 1 TU_c at point of discharge. The Permit includes a 100 meter chronic mixing zone with a dilution factor of 189 similar to

the approach taken in other related permits for oil and gas facilities in Cook Inlet issued by DEC. Instead of setting unrealistically low trigger that would likely be exceeded and trigger accelerated testing, DEC established PR BMP Revision Action Levels for chronic toxicity results, which equals the authorized dilution factor of 189. To date, no miscellaneous discharges have occurred that contain chemical additives and have been discharged greater than 10,000 gpd or 0.010 mgd. Until appropriate characterization has been conducted on such discharges, applying an overly stringent trigger of 1 TU_c at the point of discharge is not appropriate. In addition, DEC modified the chronic WET dilution series to result in collecting meaningful data for the purpose of characterizing the effluent. Removal of the TRE/TIE requirements in the Permit does not eliminate DEC's authority under Permit Section 2.6.2.3 to require additional monitoring to evaluate the cause of elevated toxicity. No water quality impacts are anticipated because the new approach targets appropriate triggers based on an authorized mixing zone, does not eliminate DEC authority to conduct TRE and TIE, and implements PR reduction strategies to reduce or eliminate pollutants. The removal of the accelerated testing, TRE, and TIE requirements complies with the Antidegradation Policy (See Section 9.4.3.2).

9.0 ANTIDEGRADATION

9.1 Legal Basis

Section 303(d)(4) of the CWA states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the State's Antidegradation Policy and implementation methods. Alaska's current Antidegradation Policy and implementation methods are presented in 18 AAC 70.015 *Antidegradation policy* (Policy) and in 18 AAC 70.016 *Antidegradation implementation methods for discharges authorized under the federal Clean Water Act* (Implementation Methods). The Policy and Implementation Methods amended through April 6, 2018 are consistent with 40 CFR 131.12; and were approved by EPA on July 26, 2018.

The following subsections document the Department's conformance with the Policy and Implementation Methods for reissuance of the Permit.

9.2 Receiving Water Status and Tier Determination and Analysis Requirements

Per the Implementation Methods, the Department identifies a Tier 1 or Tier 2 classification and protection level on a parameter by parameter basis for the waterbody. The Implementation Methods also describe a Tier 3 protection level applying to designated waters, although at this time no Tier 3 waters have been designated in Alaska.

The marine waters of Cook Inlet, to which the Permit applies, are not listed as impaired (Categories 4 or 5) in *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*. Therefore, no parameters have been identified where only the Tier 1 protection level applies. Accordingly, this antidegradation analysis conservatively assumes that the Tier 2 protection level applies to all parameters, consistent with 18 AAC 70.016(c)(1) and 18 AAC 70.015(a)(2) that states if the quality of water exceeds levels necessary to support propagation of fish, shellfish, wildlife, and recreation in and on the water, that quality must be maintained and protected, unless the Department authorizes a reduction in water quality. Prior to authorizing a reduction of water quality, the Department must first analyze and confirm the findings under 18 AAC 70.015(a)(2)(A-D) are met. Because Tier 1 protection applies to all waters of the U.S. in the state, the analysis must be conducted with implementation procedures in

18 AAC 70.016(b)(5)(A-C) for Tier 1 protection. For Tier 2 protection, the analysis must also comply with 18 AAC 70.016(c)(7)(A-F). Lastly, because this antidegradation analysis is for a general permit, 18 AAC 70.016(e) also applies. These analyses and associated finding are summarized below.

9.3 Tier 1 Analysis of Existing Use Protection

The summary below presents the Department's analyses for the Tier 1 existing use protections per 18 AAC 70.016(b)(5), finding that:

(A) existing uses and the water quality necessary for protection of existing uses have been identified based on available evidence, including water quality and use related data, information submitted by the applicant, and water quality and use related data and information received during public comment;

The Department reviewed water quality data, environmental monitoring studies, and information on existing uses in the vicinity of the Osprey Platform. The Department finds the information reviewed as sufficient and credible to identify existing uses and water quality necessary for Tier 1 protection.

(B) existing uses will be maintained and protected*; and*

Per 18 AAC 70.020 and 18 AAC 70.050, marine waters are protected for all uses. Therefore, the most stringent water quality criteria found in 18 AAC 70.020 and in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (DEC 2008) apply and were evaluated to ensure existing uses and the water quality necessary for protection of existing uses of the receiving waterbody are fully maintained and protected. Water quality criteria are developed to be protective of existing uses. The discharges authorized under the Permit are controlled or limited to either meet criteria at the point of discharge or at the boundary of the chronic mixing zone, if applicable. Given water quality is met at the boundary of the chronic mixing zone for all parameters, the existing uses of the waterbody as a whole is being maintained and protected.

(C) the discharge will not cause water quality to be lowered further where the department finds that the parameter already exceeds applicable criteria in 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b).

As discussed in (B), the Permit has been developed to ensure discharges shall not cause or contribute to a violation of water quality criteria. As previously stated, the marine waters of Cook Inlet covered under the Permit are not listed as impaired. Therefore, no parameters were identified as already exceeding the applicable criteria in 18 AAC 70.020(b) or 18 AAC 70.030.

The Department concludes the terms and conditions of the Permit will be adequate to fully protect and maintain the existing uses of the water and that the findings required under 18 AAC 70.016(b)(5) are met.

9.4 Tier 2 Analysis for Lowering Water Quality

9.4.1 Scope of Tier 2 Analysis

Per 18 AAC 70.016(c)(2), an antidegradation analysis is only required for those waterbodies needing Tier 2 protection and which have any new or existing discharges that are being expanded based on permitted increases in loading, concentration, or other changes in effluent characteristics that could result in comparative lower water quality or pose new adverse environmental impacts. Per 18 AAC 70.016(c)(2)(A), the analysis will only be conducted for the portion of the discharge that

represents an increase from the existing authorized discharge. Additionally, per 18 AAC 70.016(c)(3), DEC is not required to conduct an antidegradation analysis for a discharge that is not expanding.

Per 18 AAC 70.990(75), "new or expanded" with respect to discharges means discharges that are regulated for the first time or discharges that are expanded such that they could result in an increase in pollutant load or concentration or other changes in discharge characteristics that could lower water quality or have other adverse environmental impacts.

9.4.1.1 Discharges Meeting the Definition of New or Expanded

With the request by the Permittee for a new authorization of produced water discharge from the Osprey Platform under the Permit, a Tier 2 analysis for the lowering of water quality is warranted. The evaluation is limited to only the discharge of produced water and the limited parameters, which include oil and grease, pH, TAH and copper.

9.4.1.2 Discharges Not Meeting the Definition of New or Expanded

There are no increases in permitted loads or concentrations to existing, previously regulated discharges other than for produced water per Section 9.4.1.1. All of the limitations have stayed the same or have decreased in the Permit.

9.4.2 Tier 2 Analysis

The policy in 18 AAC 70.015(a)(2) states that if the quality of water exceeds levels necessary to support propagation of fish, shellfish, wildlife, and recreation in and on the water (i.e., Tier 2 waters), that quality must be maintained and protected. The Department may allow a reduction of water quality only after finding that the most practicable and effective pollution prevention, control, and treatment methods are being used such that lowering of water quality is necessary. Upon making this determination, the specific requirements of the policy noted in 18 AAC 70.015(a)(2)(A)-(D) must be met. The Department's findings are presented below.

As discussed in Section 3.3.8.2 the Osprey Platform produced water characterization does not demonstrate the ability to meet oil and grease ELGs based on the six samples collected to support the application. Therefore DEC requested a treatment alternatives analysis from the applicant to support their application and this antidegradation analysis. Per 18 AAC 70.016(c)(4)(C-F) the applicant must submit a description and analysis of a range of practicable alternatives that have the potential to prevent or lessen the degradation associated with the expanded discharge. The analysis must identify the water quality environmental impacts and relative costs for each practicable alternative. The permittee submitted their analysis on August 10, 2018. DEC has reviewed the supplemental information and has determined it is sufficient to support a Department decision.

The on-shore Kustatan Production Facility (KPF) currently provides primary treatment for the production fluids from the Osprey Platform. The treatment train includes chemical addition to demulsify, free water knockout vessels, coalescers, and skimmers. The permittee evaluated five alternative methods for improving treatment performance and reducing environmental impacts to the receiving water:

1) no discharge via injection,
2) single port diffuser,
3) multi-port diffuser,
4) secondary treatment consisting of induced gas flotation (IGF), and

5) tertiary treatment consisting of nutshell filtration.

The alternative of injection of produced water (method 1) was eliminated as being technically infeasible as well as cost prohibitive, and would make the permittee competitively disadvantaged with other Cook Inlet producers (EPA 1996). Assuming similar subsurface conditions exist at the KPF location as that at nearby Trading Bay Production Facility, the non-oil producing formations beneath the KPF are inadequate for the volume to be injected. Furthermore, injecting into the oil-producing formation is no longer practicable and would eliminate several currently producing oil production wells (See Section 2.3). Even if continued injection were technically feasible, the cost of installing injection wells would be up to $5,000,000.

A single port (method 2) versus multiport (method 3) diffuser analysis was conducted to determine the benefits of optimizing mixing in Cook Inlet to reduce the size of the proposed mixing zone. The cost of installing a single port is approximately $2,000,000 and the additional cost of installing a multiport diffuser is negligible, as the majority of the cost is associated with installing the main line.

Secondary treatment by IGF (method 4) meets the model technology requirements for the ELGs to attain the technology-based oil and grease effluent limits as well as reduces concentrations of metals, dissolved hydrocarbons, TAH and TAqH, in the final effluent. Nutshell filtration (method 5) was evaluated as tertiary treatment to further reduce TAH and TAqH. The cost of installing four IGF units is estimated to range between $300,000 and $550,000.

Nutshell filtration was evaluated as tertiary treatment to further reduce TAH and TAqH. Although the installation of nutshell filters would provide superior treatment benefits, there would significant cross-media environmental impacts and costs to replenish and dispose spent media. The additional environmental impacts and costs of nutshell filtration are not justifiable given the IGF alternative alone already meets regulatory requirements without cross-media environmental impacts.

The proposed alternative is to install four parallel IGF units downstream of the existing primary treatment system and discharge through a multiport diffuser. This alternative would meet regulatory requirements and place the permittee on par with other Cook Inlet producer treatment systems. The use of multiport diffusers ensures an optimally-sized mixing zone around which the water quality criteria effectively will be met in the receiving water.

The Department finds that the combined IGF and multiport diffuser alternative provides the most practicable and effective method of pollution prevention, control, and treatment. However, the Department also finds that the proposed pollution control and treatment alternative would still require some lowering of water quality under 18 AAC 70.015(a)(2)(A).

9.4.3 Basis for Reduction of Water Quality

Based on the above finding, the Department can authorize a reduction in water quality only after the applicant has submitted sufficient evidence for the Department to make the necessary findings under the Antidegradation Policy in 18 AAC 70.015(a)(2)(A – D):

9.4.3.1 Accommodation of Important Social or Economic Development in the Vicinity

(A) Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.

The ability for the permittee to discharge produced water at the Osprey Platform has an economic benefit statewide and down to the local area of operation. Maintaining oil production in Cook Inlet is

vital to the economic recovery and sustainability of Alaska from low oil prices and helps prevent additional layoffs in a difficult economy.

Oil and Prices and Employment: In 2014, oil prices began to drop rapidly which lead to an immediate drop in revenue for the State of Alaska. In early 2015, as the price of oil fell below $40 per barrel, the State government began to cut jobs and capital projects in a measure to reduce expenses. The oil and gas industry maintained high employment through 2014 but the continued drop in oil prices through 2015 and into 2016 prompted rapid jobs cuts. In 2016, the oil and gas service industry lost 2,900 jobs, professional services were reduced by 1,600 jobs, the construction sector lost 1,400 jobs, and the State government shrank by 1,200 jobs (Alaska Department of Labor and Workforce Development [ADLWD] 2018). By 2017, the price of oil began to rebound (averaging $50 per barrel); however, the oil and gas industry and state government still eliminated approximately 3,600 jobs to offset revenue reductions. As the price of oil continues to increase in 2018 and initial planning begins for many new oil and gas projects, further job cuts are expected to be reduced (ADLWD 2018).

Authorization to discharge produced water would allow the permittee to immediately increase production by 250 to 500 bbl/day through increased well pumping rates without the need to increase disposal well capacity. In addition to the increase in well production, the authorization to discharge produced water would facilitate Permittee investment in drilling and developing additional new wells in Cook Inlet over the next 3 to 5 years. This is estimated to add up to 2,000 bbl/day to production and a direct increase in work force would also result from these new production wells coming on line (See Kenai Peninsula Borough discussion, below). Alternatively, an inability to discharge produced water will result in reduced production and associated reductions in workforce.

Statewide: The Alaska Oil and Gas Association (AOGA) assesses the role of the oil and gas industry on Alaska's private and public-sector economy (McDowell 2017). The latest 2016 analysis presents the 14 primary oil and gas companies' economic contribution to the State of Alaska. The permittee, also doing business as Glacier Oil and Gas, was one of the 14 companies included in the research and is one of the few that operates solely in Alaska.

In 2016, the 14 primary oil and gas companies directly employed 4,275 Alaska residents, indirectly supported another 6,095 Alaskan employees in the oil and gas support sector, and spent approximately $4.6 billion in operating and capital expenditures with approximately 1,000 Alaskan vendors.

- Direct, indirect and induced jobs supported by the Alaska oil and gas industry totaled 45,575 jobs and $3.1 billion in wages.
- State and local royalties and taxes paid by the Alaska oil and gas sector directly and indirectly creates approximately 58,300 jobs and generates $2.9 billion in wages.
- In total, the Alaska oil and gas sector directly and indirectly supported a total of 103,875 jobs in Alaska and paid $6 billion in wages.
- Regionally, the 14 primary oil and gas companies impact jobs and wages in the Municipality of Anchorage, the Kenai Peninsula Borough, and the Matanuska-Susitna Borough.

Anchorage: In Anchorage, the industry directly employs approximately 2,265 full-time positions and accounts for $409 million in annual wages. In addition, an estimated 2,025 oil and gas support services employees reside in Anchorage with annual wages of $220 million. Additionally, 24,050 indirect jobs in Anchorage are connected to the oil and gas industry in Alaska. Wages spent by employees supporting the oil and gas industry create even more jobs and income in Anchorage (induced impacts). In total, these jobs accounted for approximately $1.2 billion in annual wages in Anchorage.

Matanuska-Susitna Borough (MSB): In the MSB, the oil and gas industry has 515 direct employees and accounts for $89 million in wages; additionally, 1,580 oil and gas support service jobs total $144 million in wages. Although few industry-related jobs are located in the MSB, for all direct, indirect, and induced effects, the oil and gas industry accounted for an annual average of 3,270 jobs in the MSB and total annual payroll of $287 million.

Kenai Peninsula Borough (KPB): In the KPB, oil and gas has 810 direct employees and accounts for $142 million in wages. Additionally, 1,615 oil and gas support service jobs provide $153 million in wages. Six of the top 10 business taxpayers in the KPB are oil and gas companies; this includes the permittee. Currently the permittee employs approximately 40 full-time personnel within Cook Inlet.

Limiting disposal to injection means the permittee is limited economically to the volume of produced water that can be injected. As a result of obtaining authorization to discharge produced water, the permittee investment of new production wells is estimated to directly employ up to six year-round and 117 seasonal full-time positions (Table 4-1). Table 7 provides a summary of anticipated labor increases.

Table 7: Projected Induced Employment

Job Description	Number of Full-time Positions
Year-Round Positions	
Administrative and Management	2
Production/Maintenance	4
Seasonal Positions	
Exploration Drilling	50
Completion Operations	5
Logistical Support (air/marine)	12
Contractors	50

The Department finds that the criteria for social or economic benefit in the vicinity of the discharge is met.

9.4.3.2 Reducing Water Quality Will Not Violate Applicable Criteria

(B) Except as allowed under this subsection, reducing water quality will not violate the applicable criteria of 18 AAC 70.020 or 18 AAC 70.235 or the whole effluent toxicity limit in 18 AAC 70.030.

18 AAC 70.020(b) specifies the State's protected water use classes, subclasses, and water quality criteria necessary to ensure protection of these uses. As allowed under 18 AAC 70.240, the Permit includes authorization of a rectangular chronic mixing zone that is 1,060 meters long (530 meters in each prevailing current direction) by 348 meters wide. The mixing zone was appropriately sized using CORMIX software model results and newly available data for the multiport diffuser (discussed in Section 5.3.1.3) such that all water quality criteria will be met at, and beyond, the boundary of this chronic mixing zone. Accordingly, the Department finds that reducing water quality will not violate the applicable criteria in 18 AAC 70.020, and therefore, this criterion has been met.

Waterbodies subject to site-specific criteria are listed in 18 AAC 70.236. 18 AAC 70.235 refers to the establishment of site-specific water quality criteria. Although there are site-specific criteria established for metals and turbidity in Cook Inlet, the specified location near Point Woronzof for these site-specific criteria is not in the vicinity of the Osprey Platform, which is located south of the Forelands. Hence, the

discharge of produced water from the Osprey Platform will not violate the site-specific criteria in Cook Inlet. Accordingly, the Department finds that reducing water quality in the mixing zone will not violate the site-specific criteria in 18 AAC 70.235, and therefore, this criterion has been met.

18 AAC 70.030 applies to WET limits and requires that an effluent discharged to a water may not impart chronic toxicity to aquatic organisms, expressed as 1.0 TU_c, at the point of discharge, or if the department authorizes a mixing zone in a permit at or beyond the mixing zone boundary, based on the minimum effluent dilution achieved in the mixing zone. The chronic mixing zone is authorized to have a chronic dilution factor of 156. Chronic WET is one of the authorized mixing zone monitoring parameters for the produced water (Discharge 015) but the establishment of an effluent limit was not required because the observed toxicity is 63.29 TU_c, and the toxicity that would result in reasonable potential at the boundary of the authorized chronic mixing zone is 156 TU_c based on TAH as the driving parameter. Hence, no chronic WET effluent limits are being imposed in the Permit and the Department finds that reducing water quality will not violate the WET effluent limits in 18 AAC 70.030(a). Therefore, this criterion is met.

9.4.3.3 Tier 1 Protection of Existing Uses

(C) The resulting water quality will be adequate to fully protect existing uses of the waterbody.

As discussed in part (B) of the preceding Tier 1 analysis in Section 9.3, marine waters are protected for all uses and all water quality criteria developed to protect these uses are met at the boundary of the chronic mixing zone for produced water. Hence, the Department finds that the reduction in water quality will be protective of the existing uses of water.

9.4.3.4 All Wastes and Other Substances Discharged Will be Treated and Controlled

(D) All wastes and other substances discharged will be treated and controlled to achieve (i) for new and existing point sources, the highest statutory and regulatory requirements.

The applicable "highest statutory and regulatory requirements" for treatment and control are defined in 18 AAC 70.015(d). The definition includes the four components noted below:

(1) Any federal technology-based effluent limitation identified in 40 CFR 122.29 and 125.3, revised as of July 1, 2017 and adopted by reference;

EPA promulgated 40 CFR 435 Subpart D in 1996, as adopted in 18 AAC 83, and determined that discharges of produced water to Cook Inlet are appropriately controlled through ELGs for oil and grease (MDL of 42 mg/L and an AML of 29 mg/L). Prior to the Osprey Platform obtaining authorization to discharge produced water under the Permit, successful implementation of the alternative analysis will be required. The applicant must submit plans to the Department under 18 AAC 72 to ensure the treatment will meet the treatment requirements for the Permit as reflected by the model technology assumptions in the ELG. In addition to the TBEL established through the ELG, DEC also imposes a TBEL using case-by-case BPJ for pH. Therefore this part of the definition is met.

(2) any minimum treatment standards identified in 18 AAC 72.050;

This part of the definition addresses the minimum treatment standards for domestic wastewater discharges. Per 18 AAC 72.050(a)(4) domestic wastewater discharges into the waters of the US must have received secondary treatment prior to discharge. Given the discharge being evaluated is not domestic wastewater, this part of the definition does not apply.

(3) any treatment requirements imposed under another state law that is more stringent than a requirement of this chapter [18 AAC 70]; and

This part of the definition includes any treatment required by state law that is more stringent than 18 AAC 70. Other regulations beyond 18 AAC 70 that may apply to this permitting action include 18 AAC 15, 18 AAC 72, and 18 AAC 83. The Permit is consistent with the minimum treatment requirements of 18 AAC 72 and 18 AAC 83 and neither the regulations in 18 AAC 15, nor any other state legal requirement that the Department is aware of, impose more stringent treatment requirements than 18 AAC 70. Therefore, this part of the definition is met.

(4) any water quality-based effluent limitations established in accordance with 33 U.S.C. 1311(b)(1)(C) (Clean Water Act, sec. 301(b)(1)(C)).

Alaska WQS are presented in 18 AAC 70.020 and the "*Water Quality Criteria for Toxics and Other Deleterious Substances*" amended through December 12, 2008 (*Toxics Manual*). WQBELs have been established to be more stringent than applicable TBELs per the *Reasonable Potential Analysis and Effluent Limits Development Guide*, June 30, 2014 (*RPA/WQBEL Guidance*), which complies with 18 AAC 83.435 and CWA 301(b)(1)(C). The Permit imposes WQBELs for TAH (MDL of 9.0 mg/L and AML of 7.7 mg/L) and for copper (MDL of 195 µg/L and AML of 97 µg/L). During development of these WQBELs, DEC used ambient data collected from ICIEMAP that provided information on the existing water quality and potential contributions of pollutants from nonpoint sources and other point sources discharging within Cook Inlet. No detectable TAH concentrations were measured in the ambient receiving water. For copper, an ambient concentration of 0.926 µg/L (representing the 85th percentile of the data collected) was used in the WQBEL development. Based on the foregoing, this part of the definition has been met.

Therefore, the definition of "highest statutory and regulatory treatment requirements" for treatment and control has been met. Accordingly, the Department finds that the produced water will be treated and controlled to achieve applicable highest statutory and regulatory requirements per 18 AAC 70.015(a)(2)(D).

9.4.3.5 **Treatment and Control of Discharges from Point and Non-Point Sources**

Per 18 AAC 70.016(c)(7)(C), DEC must consider other point sources and state-regulated non-point sources discharging to the waterbody that could impact water quality and if there are any outstanding compliance issues with point source permits or BMPs for non-point sources. DEC identified the following seven permitted point sources in the vicinity of the Osprey Platform that have APDES discharge limits for oil and grease, TAH, pH, or copper:

- AK0000396 – Cook Inlet Pipeline Company, Drift River Terminal (DRT)
- AK0000507 – Agrium Inc., Kenai Plant
- AK0000841 – Tesoro Alaska Petroleum Company, Kenai Refinery
- AK0001155 – Kenai LNG Corporation, Kenai LNG Facility
- AK0026603 – Chugach Electric Association, Beluga Power Plant
- AK0053619 – Alaska Electric and Energy Coop., Nikiski Combined Cycle Plant
- AKG003025 – Hilcorp Alaska, LLC, DRT 30-inch Pipeline Cook Inlet
- AKG003026 – Harvest Alaska, LLC, Cook Inlet Pipeline Extension

In review of these individual permits, DEC found no outstanding compliance issues that affect the antidegradation analysis. For state-regulated non-point sources, DEC considered several contaminated

sites in the vicinity of the Nikiski industrialized area (e.g., refinery, LNG, power plant, fertilizer plant) that have plumes that enter Cook Inlet through groundwater. These sources are regulated by the DEC Contaminated Sites Program and require continued monitoring of plume attenuation.

With respect to these point source and non-point sources, none of the receiving water samples collected by ICIEMAP were reported with detectable concentrations of TAH. In addition, the 85th percentile concentration for copper is 0.926 mg/L, which is below the chronic marine water quality criteria for copper. This information supports the finding that discharges from new and existing point sources meet the highest statutory and regulatory requirements. In addition, it supports the finding that there are no issues with the BMPs being applied to non-point sources.

In addition, the Permit requires the permittees of point sources to implement BMP Plans to minimize the production and discharge of pollutants and for ambient water quality monitoring. These requirements provide additional oversight of treatment processes and protection of the receiving waters and overall environment of Cook Inlet in the vicinity of the Osprey Platform.

Hence the requirement for the treatment and control of discharges from point and non-point sources per 18 AAC 70.016(c)(7)(C) is met.

Per the aggregate findings in Sections 9.4.3.1 through 9.4.3.5, DEC determines that the applicant has submitted sufficient evidence for the Department to authorize lowering of water quality associated with the discharge of produced water from the Osprey Platform.

10.0 OTHER PERMIT CONDITIONS

10.1 Standard Conditions

Appendix A of the Permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on the regulations and cannot be challenged in the context of an individual APDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, and other general requirements.

10.2 Quality Assurance Project Plan

The permittee is required to develop and implement a facility-specific QAPP that ensures all monitoring data associated with the Permit are accurate and to explain data anomalies if they occur. The permittee is required to develop and implement procedures in a QAPP that documents standard operating procedures the permittee must follow for collecting (i.e., chronic WET sample collection per Section 7.3.5.3), handling, storing and shipping samples; laboratory analysis (e.g., most sensitive methods); and data reporting. If a QAPP has already been developed and implemented, the permittee must review and revise the existing QAPP to ensure it includes the necessary content. The permittee must submit a letter to the Department within 90 days of the effective date of the Permit certifying that the QAPP has been revised and implemented. The QAPP shall be retained onsite and made available to the Department upon request.

10.3 Best Management Practices Plan

A Best Management Practices Plan (BMP plan) presents operating and housekeeping measures intended to minimize or prevent the generation and potential release of pollutants from a facility to the waters of

the U.S. during normal operations and additional activities. Per 18 AAC 83.475(4), "A permit must include best management practices to control or abate the discharge of pollutants and hazardous in a permit when the practices are reasonably necessary to achieve effluent limitations and standards…"

Within 90 days of the effective date of the Permit, the permittee must review, revise as necessary, implement the BMP Plan to address current activities at the terminal and submit written certification of the review, revision and implementation to DEC.

In each subsequent year of the Permit, the permittee must establish a committee to review and revise the BMP Plan as necessary to address any modifications or changes to operational practices at the terminal and to continue to meet the objectives and specific requirements of the Permit. The permittee must submit written certification to DEC that the BMP Plan review committee has reviewed the BMP Plan, and modified if necessary, by January 31st of each year the Permit remains in effect.

10.3.1 Specific BMP Requirements

In addition to the standard BMP components listed in Section 10.3.2, DEC requires the following specific BMPs be included in the BMP Plan for the applicable discharges.

10.3.1.1 BMPs for Deck Drainage

The permittee must develop and implement BMPs for ensuring precipitation and melt water that is contaminated is processed through an oil-water separator, or other similar treatment process, prior to discharge.

10.3.1.2 BMPs for Graywater

Per Section 7.2.3, permittees shall develop and implement housekeeping BMPs which ensure discharges do not contain oil (e.g., cook oils), floating solids, foam or garbage and have minimal chemical cleaning compounds and disinfection products (e.g., chlorine) through adherence with manufacturer's instructions.

10.3.1.3 BMPs for Miscellaneous Discharges Potentially Contaminated with Oil

Per Section 7.2.3, specific BMPs must be developed and implement to support the prohibition of free oil for the following miscellaneous discharges:

- Discharge 012 - Excess Cement Slurry
- Discharge 013 - Fluids, Cuttings, and Cement at the Seafloor

10.3.1.4 Miscellaneous Discharges 005, 009 and 014 Pollution Reduction BMPs

Per Section 7.3.4, DEC requires that the BMP Plan include a specific BMP to optimize the use of chemicals (e.g., a chemical-dosing matrix) and to minimize the potential for chronic toxicity in discharges of desalination waste (Discharge 005), noncontact cooling water (Discharge 009) and waterflooding (Discharge 014) that are required to monitor for chronic WET. Upon exceeding chronic WET PR BMP Revision Action Levels, the permittee must modify this specific BMP to include BMP revisions to reduce subsequent chronic toxicity to below the PR BMP Revision Action Levels. Examples of BMP revisions include, but are not limited to, revamping the chemical dosing matrix or injection practices; substitution of less toxic chemicals; eliminating, reducing, or controlling spikes resulting from batch dosing; or alternative disposal options. BMPs must continue to be revised until the chronic WET PR BMP Revision Action Levels are attained. If the BMP revision involves significant physical changes

to the treatment and disposal system, the permittee must describe these modifications in submittals required in Section 7.3.4 and submit update line diagrams reflecting these modifications with the next application for reissuance

10.3.1.5 Cooling Water Intake Structure Requirements

The Permit incorporates 40 CFR Part 125, Subpart N updated in 2014 and adopted by reference at 18 AAC 83.010(c)(9) for cooling water intake structures (CWIS) that requires new offshore oil and gas facilities to take measures to reduce entrainment and impingement of aquatic life associated with the construction and operation of CWIS. The CWIS regulation was promulgated to ensure that the location, design, construction, operation and capacity of CWIS reflect the best technology available to minimize adverse impacts to aquatic organisms.

The CWIS regulations apply to all facilities, new or existing, that are a point source discharge, intake 2 million gallons per day of water, and use at least 25 percent of that water for cooling. Per CWIS regulations, the owner or operator of a new offshore oil and gas extraction facility must comply with: (i) Track I in 40 CFR Part 125.134(b) or Track II in 40 CFR Part 125.134(c) if it is a fixed facility; or (ii) Track I in 40 CFR Part 125.134(b) if it is not a fixed facility (i.e., MODU).

The Permit requires the permittee to select and implement technologies or operational measures to minimize impingement mortality and entrainment of fish and shellfish and include this information in the BMP Plan. The BMP Plan requirement gives the permittee discretion on what methods to select and how to implement those methods. However, the Department retains the authority to impose more stringent conditions on a case-by-case basis, if such conditions are deemed necessary by the Department to comply with any provision of law in accordance with the Permit. Specifically, DEC can require the implementation of additional technologies and operational measures if there is information indicating the potential for specified aquatic organisms to pass through the hydraulic zone of influence of the cooling water intake structure.

10.4 Domestic Wastewater Characterization and Treatment Study Requirements

The permittee is required to develop a sampling and analysis plan (SAP) of domestic wastewater discharges (treated black water and graywater), develop updated conceptual line diagrams depicting both graywater and treated black water systems for each potentially affected facility, and provide recommendations for DEC consideration. Recommendations may include, but are not limited to, modified limitations based on recent characterization data that would be protective of human health and the environment, proposed modifications to existing practices or upgrades to existing collection, treatment and disposals systems to meet existing limits based on the most recent version of 18 AAC 72. The SAP must be submitted to DEC for review by December 31 of the second year of the term of the Permit. A characterization report with line diagrams and recommendations must be submitted with the next application for reissuance.

11.0 OTHER LEGAL REQUIREMENTS

11.1 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with NMFS (a part of NOAA) and FWS if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult with these federal agencies regarding permitting actions.

DEC did, however, voluntarily send an email to both the FWS and NOAA on June 15, 2018 notifying the agencies of current permit development activities and requesting critical habitat listings in the vicinity of the facility.

FWS responded by directing the Department to access and consult with the FWS Information, Planning, and Conservation (IPaC) System website at https://ecos.fws.gov/ipac/location. DEC consulted with the FWS IPaC System website, as directed.

Although DEC did not receive a response from NOAA, DEC consulted the online NOAA Alaska Endangered Species and Critical Habitat Web Application, an interactive mapper located at https://www.fisheries.noaa.gov/resource/data/alaska-endangered-species-and-critical-habitat-mapper-web-application to identify ESA species of concern and critical habitat in the waters adjacent to the facility.

Based on these sources of information, there are three listed threatened or endangered species in Cook Inlet and one of those species has designated critical habitat areas.

The following threatened or endangered species have been identified as potentially occurring in the vicinity of the facility in Cook Inlet and are potentially affected by discharges covered under the Permit:

- Beluga Whale (*Delphinapterus leucas*): Endangered Marine Mammal, with designated critical habitat areas
- Northern Sea Otter (*Enhydra lutris kenyoni*): Threatened Marine Mammal
- Short-Tailed Albatross (*Phoebastria [=Diomedea] albatrus*): Endangered

11.1.1 **Beluga Whale: Endangered Marine Mammal**

In the United States, Beluga whales are divided into five stocks (termed as distinct population segments, or DPS, in the ESA), all in Alaskan waters: Beaufort Sea, Bristol Bay, Cook Inlet, eastern Bering Sea, and eastern Chukchi Sea (NMFS 2003). All beluga whale populations are protected under the Marine Mammal Protection Act (MMPA) which prohibits the take (i.e., harass, hunt, capture, or kill) of all marine mammals. The Cook Inlet DPS belugas are included in a NOAA initiative that prioritizes recovery efforts for animals considered most at risk for extinction. NOAA designated the Cook Inlet DPS as depleted (i.e., they have fallen below their optimum sustainable population levels) under the MMPA on May 31, 2000 (65 FR 34590) and the Cook Inlet DPS was designated as endangered under the ESA (73 FR 62919) on October 22, 2008. Two areas of critical habitat were designated in Cook Inlet on April 11, 2011 (76 FR 20180, 50 CFR 226.220); each of the two areas supports a distinct and crucial aspect of the Cook Inlet beluga whale life history.

More recently, NOAA adopted a Recovery Plan for the Cook Inlet Beluga Whale DPS on January 5, 2017 (82 FR 1325).The Cook Inlet DPS is an isolated stock, spending the entire year in Cook Inlet, with the majority of the being time spent in the northern portion of Cook Inlet. Because calving events have not been documented in Cook Inlet, specific calving grounds have not been identified. However, the shallow waters of the upper Inlet may serve as calving and nursery grounds. The recovery plan strategy consists of data acquisition and integration of data from multiple sources along with the application of those results to management. The recovery plan prioritizes curbing the population decline and stabilizing the population. The recovery plan focuses on addressing threats to recovery ranked of higher relative concern, which include catastrophic events (e.g. natural disasters, spills, mass strandings), cumulative effects of multiple stressors and noise (NOAA 2016).

11.1.2 **Northern Sea Otter: Threatened Marine Mammal**

Sea otters are protected under the MMPA. FWS recognizes three stocks (termed as distinct population segments, or DPS, in the ESA) of sea otters in Alaska: southeast Alaska, southcentral Alaska, and southwest Alaska. Maps showing the approximate distribution and stock boundaries of northern sea otters in Alaska waters show that both the southcentral and southwest stocks occur in Cook Inlet, and the relative location of the boundary between the stocks indicates that the facility is closer to the southcentral stock. However, the facility does not appear to be located within the areas where either stock historically has been distributed.

FWS issued a final rule listing the southwest Alaska DPS of the northern sea otter as threatened under the ESA on August 9, 2005 (70 FR 46366). On August 15, 2006, the FWS issued a final special rule for the southwest Alaska DPS of the northern sea otter (71 FR 46864). The special rule allows for the limited noncommercial import and export of items that qualify as authentic native articles of handicrafts and clothing that were derived from sea otters legally taken for subsistence purposes by Alaska Natives from the listed population. On April 21, 2014, FWS announced (79 FR 22154) availability of a revised final stock assessment report required under MMPA for the three northern sea otter stocks in Alaska: southwest, southcentral and southeast. A strategic stock is defined in the MMPA as a marine mammal stock "(a) for which the level of direct human-caused mortality exceeds [the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimal sustainable population]; (b) which, based on the best available scientific information, is declining and is likely to be listed as a threatened species under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) [the "ESA"], within the foreseeable future; or (c) which is listed as a threatened or endangered species under the ESA, or is designated as depleted under [the MMPA]" 16 U.S.C. 1362(3)(19). The 2014 stock assessment report included conclusions that the southwest stock is strategic and that the southcentral stock is nonstrategic.

Critical habitat was designated by FWS on October 8, 2009 (74 FR 51988). Critical habitat areas contain all the elements necessary for the conservation of the southwest Alaska northern sea otter population and thus is subject to special management considerations and protections. However, the designation of critical habitat does not require that any management or recovery actions take place on the lands included in the designation. Even in cases where consultation is initiated under ESA, the end result of consultation is to avoid jeopardy to the species or adverse modification of its critical habitat, but not necessarily to manage critical habitat or institute recovery actions on critical habitat. Sea otters eat primarily benthic (bottom-dwelling) invertebrates; they require cover and shelter from marine predators. The areas sea otters require for food and cover are primarily shallow (less than 20 meters deep) nearshore (within 100 meters of the mean tide line) waters. Designated habitat areas occur in Cook Inlet, but extend from lower Cook Inlet farther south of the facility, and then to the west toward Kodiak Island and the Alaska Peninsula.

The availability of the *Southwest Alaska Distinct Population Segment of the Northern Sea Otter (Enhydra lutris kenyoni) – Recovery Plan* (FWS 2013) was announced on September 6, 2013 (78 FR 54905). Of the five management units within the DPS, the facility is closest to, and north of the Kodiak, Kamishak, Alaska Peninsula Management Unit, which extends into the west side of lower Cook Inlet. The cause of the overall decline in sea otter population is not known with certainty, but increased predation was identified as the most likely cause. As predation is considered to be the most important threat to recovery, additional research on that topic is a high priority. High-priority actions for the Kodiak, Kamishak, Alaska Peninsula Management Unit also include curbing overutilization, fishery bycatch and illegal take threats, identifying characteristics of sea otter habitat, and ensuring that

adequate oil spill response capability exists in southwest Alaska, since sea otters are subject to both immediate and long-term effects of oil contamination.

11.1.3 Short-Tailed Albatross: Endangered

The range of the short-tailed albatross covers most of the North Pacific Ocean, as well as the Sea of Okhotsk and the East China Sea. The species is known to breed on only two remote islands in the western Pacific, one of which is an active volcano. Short-tailed albatross spend much of their time feeding in continental shelf-break areas, and their range includes areas of the Bering Sea, Aleutian Islands and other Alaskan waters inclusive of the facility location.

The short-tailed albatross was first listed as an endangered species on June 2, 1970 (35 FR 8491). FWS issued a final rule (65 FR 46643) under the ESA on July 31, 2000 listing the short-tailed albatross as endangered throughout its range in the U.S. and with the final rule, the FWS determined that designation of critical habitat was not prudent for the short-tailed albatross based on their analysis and determination that such designation would not be beneficial to the species.

On May 20, 2009 FWS issued notice (74 FR 23739) of the final *Short-Tailed Albatross Recovery Plan* (FWS 2008). Natural threats to short-tailed albatrosses include loss of nesting habitat to volcanic eruptions, mud slides and erosion from severe storms, and competition with black-footed albatrosses; human-induced threats include hooking and drowning on commercial longline gear, entanglement in derelict fishing gear, ingestion of plastic debris, contamination by oil and other pollutants, and potential depredation or habitat degradation by non-native species. In addition to the continued monitoring of the population and its distribution, some of the highest priority measures in the recovery plan include efforts to establish breeding colonies on non-volcanic islands and to reduce the incidental take of seabirds by the fishing industry. FWS projects that the short-tailed albatross could be delisted in the year 2033, contingent on numerous assumptions of successful implementation of the recovery plan (FWS 2008).

11.2 Essential Fish Habitat

Essential fish habitat (EFH) includes waters and substrate (sediments, etc.) necessary for fish to spawn, breed, feed, or grow to maturity. The 1996 amendments to the Magnuson-Stevens Fishery Management and Conservation Act set forth a number of new mandates for NOAA, regional fishery management councils, and other federal agencies to identify and protect EFH. It requires federal agencies to consult with NOAA when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH.

As a state agency, DEC is not required to consult with these federal agencies regarding EFH. However, DEC did access EFH information at NOAA's interactive online mapping application, EFH Mapper, located at: http://www.habitat.noaa.gov/protection/efh/efhmapper/index.html.

> The tool shows that Cook Inlet, inclusive of the facility, serves as EFH for both mature and immature Chinook, Chum, Coho, Pink, and Sockeye salmon.

11.3 Permit Expiration

The Permit will expire five years from the effective date of the Permit.

12.0 **REFERENCES**

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17. Zimmermann, M., and M. M. Prescott. 2014. Smooth sheet bathymetry of Cook Inlet, Alaska. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-275, 32 pp.

APPENDIX A. FIGURES

Figure 1: Location Map – Osprey Platform

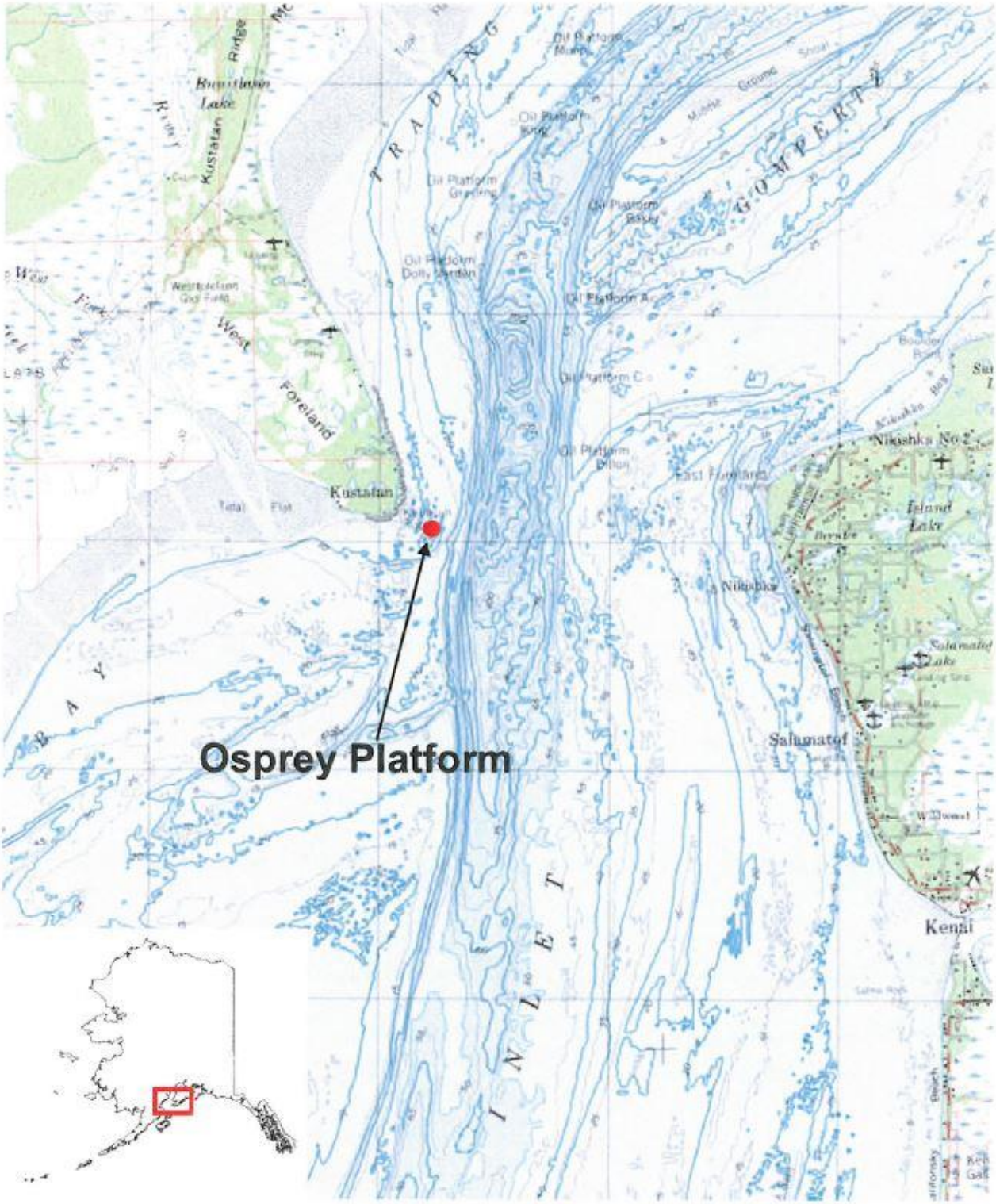


Figure 2: Osprey Platform

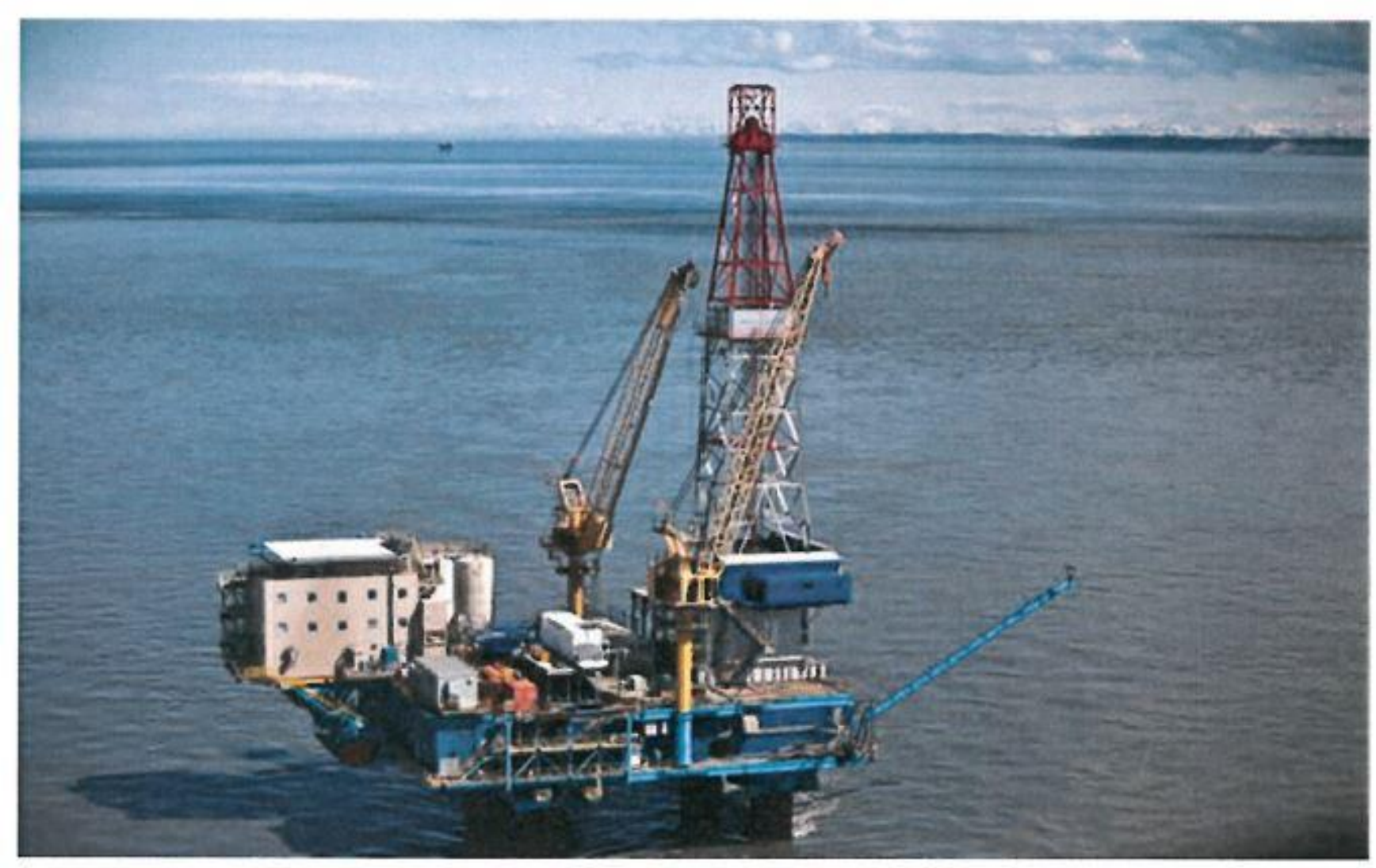


Figure 3: Water Flow Diagram

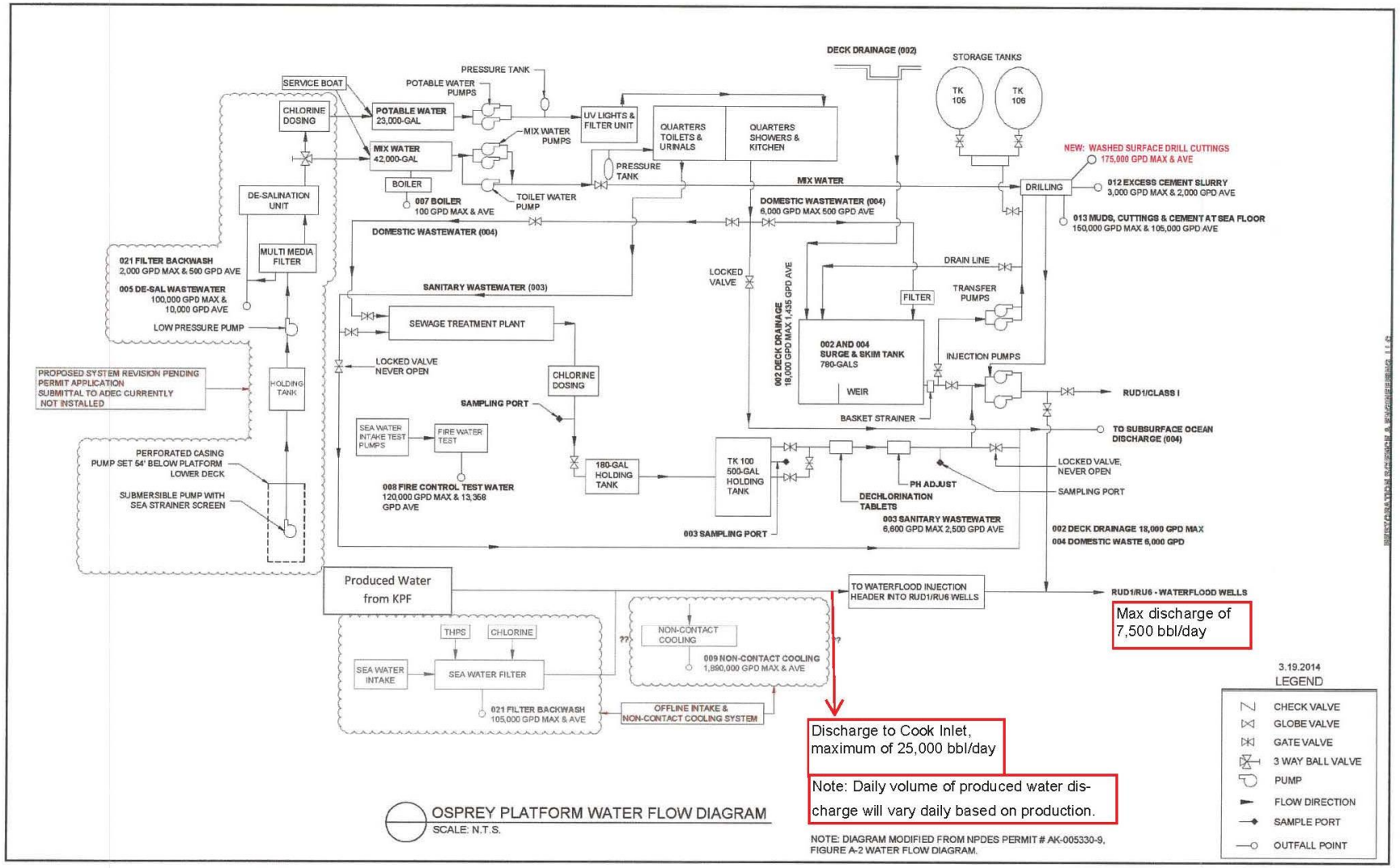
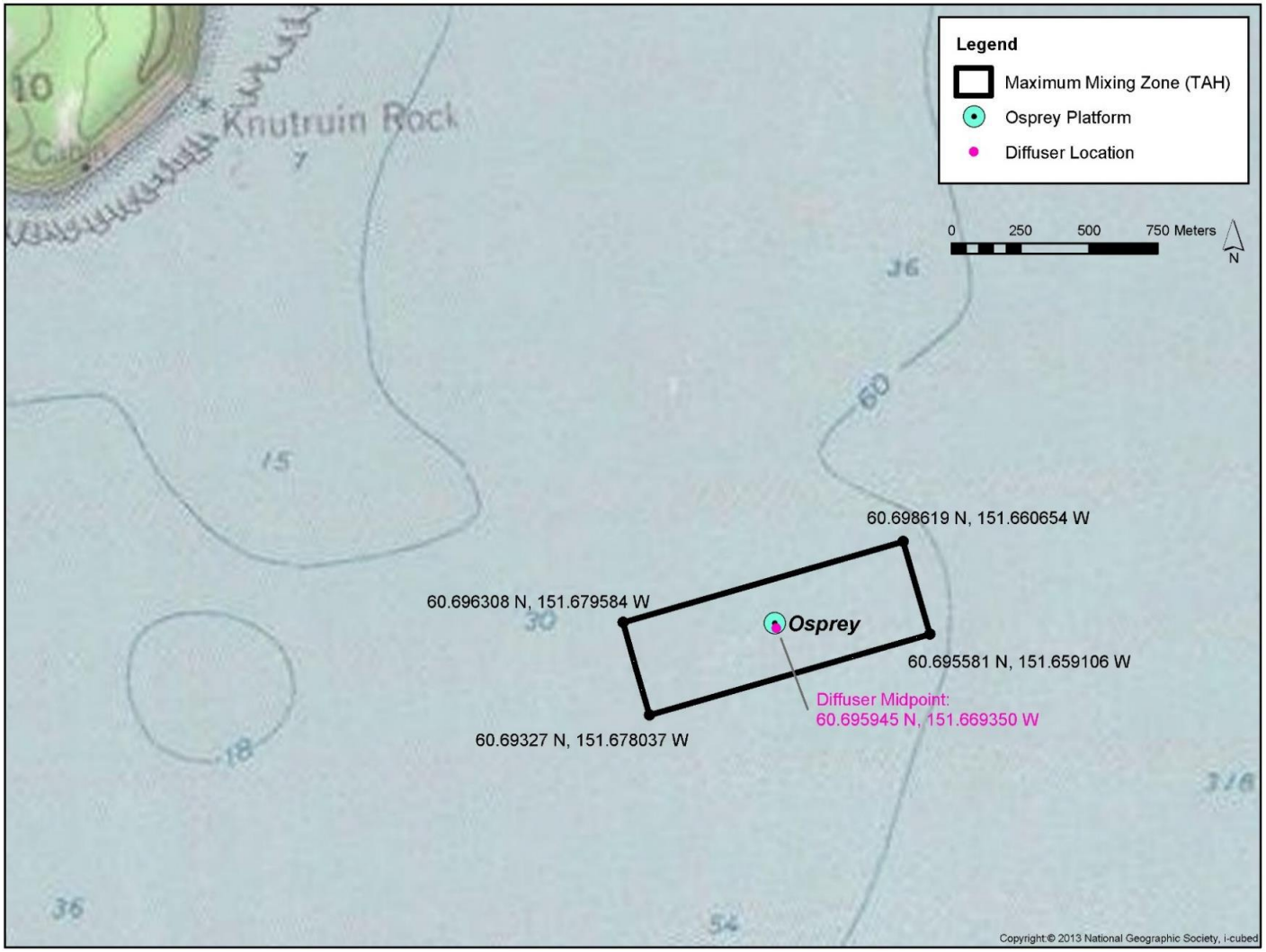


Figure 4: Osprey Platform Chronic Mixing Zone General Alignment



APPENDIX B. REASONABLE POTENTIAL ANALYSIS

Per 18 AAC 83.435(b), "Effluent limits in a permit must control all pollutants or pollutant parameters, either conventional, non-conventional, or toxic pollutants, that the department determines are or may be discharged at a level that will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard (i.e., criteria), including state narrative criteria for water quality." This Appendix summarizes the reasonable potential analysis (RPA) procedure used by the Alaska Department of Environmental Conservation (Department or DEC) to determine if development of water quality-based effluent limits (WQBELs) are necessary for individual permit AK0053309 – Cook Inlet Energy, LLC, Osprey Platform (Permit).

Characterization of the discharge is the first step of an RPA. Because CIE has not discharged produced water, DEC required a characterization study of hydrocarbons and metals to characterization the effluent. The purpose of the characterization process is to identify the potential parameters of concern (POCs), such as parameters with technology-based effluent limits and water quality parameters that exceed criteria at the point of discharge. Those parameters that exceed acute or chronic criteria at the point of discharge are evaluated by considering the variability of the data and applying a factor to the highest observed concentrations to determine which parameter requires the most dilution to meet applicable water quality criteria. The parameters that require the most dilution to meet their respective acute and chronic criteria are typically the driving parameters that determine the size of the acute and chronic mixing zones. Because DEC discretionarily authorizes less dilution than required, these driving parameters end up exceeding criteria at the boundary of the mixing zone, which triggers reasonable potential and forces development of a WQBEL for that parameter. If DEC constrains mixing zones significantly (e.g., in an impaired waterbody) and authorizes a dilution factor much lower than that required to meet the water quality criteria of the driving parameter, the second ranked POC could also have reasonable potential. However, this situation is not common.

After screening for POCs as described in Fact Sheet Section 3.0, DEC analyzes the concentrations of the POCs in the discharge to determine if it will cause, or contribute to, an exceedance of water quality criteria per the RPA procedures described in the *RPA and WQBEL Development Guide, June 30, 2014 (RPA&WQBEL Guide)*. The *RPA&WQBEL* Guide is based partly on procedures in the Environmental Protection Agency (EPA) *Technical Support Document for Water Quality-Based Toxics Control, 1991* (*TSD*) that were modified by the Department. The accompanying spreadsheet tool is used to evaluate whether reasonable potential exists for a discharge of effluent containing a maximum expected concentration (MEC) of a parameter by comparing the projected receiving water concentration at the boundary of the authorized acute or chronic mixing zones to the applicable water quality criteria for that parameter. Reasonable potential exists if the projected receiving waterbody concentration (RWC) at the boundary of the respective mixing zone exceeds the applicable criteria for that parameter. If reasonable potential exists, a WQBEL must be included in the Permit per 18 AAC 83.435.

Based on the characterization in Fact Sheet Section 3.0, only the produced water discharge requires an RPA; the other discharges authorized by the Permit do not have water quality parameters that could exceed criteria at the boundary of the mixing zones. The RPA procedures used by DEC are summarized in subsequent sections of this appendix, followed by example calculations specific to the Osprey Platform produced water discharge (015).

B.1 Mass Balance

For discharge of a parameter at the MEC into a marine receiving environment with a known ambient water concentration (AWC), the projected receiving waterbody concentration (RWC) is determined using a steady state model represented by the following mass balance equation:

$$(V_{MEC} + V_{AWC})RWC = V_{MEC}MEC + V_{AWC}AWC \qquad \text{(Equation B-1)}$$

where,

RWC = Receiving waterbody concentration downstream of the effluent discharge.

MEC = Maximum projected effluent concentration.

AWC = Ambient waterbody concentration, taken as the 85th percentile of data or 15 percent of the chronic criteria if no ambient data is available. The AWC for copper was calculated based on 15 percent of the chronic criteria.

V_{MEC} = Volume of the maximum expected effluent concentration discharged into the control volume.

V_{AWC} = Volume of the ambient receiving water in the control volume.

The dilution factor for a discharge to meet water quality criteria at the boundary of a mixing zone is defined as:

Dilution Factor (DF), $DF = \frac{(V_{MEC}+V_{AWC})}{V_{MEC}}$ (Equation B-2)

Upon separating variables in Equation B-1, substituting Equation B-2, and rearranging yields:

$$DF = \frac{(MEC-AWC)}{(RWC-AWC)} \qquad \text{(Equation B-3)}$$

Rearranging Equation B-3 to solve for RWC yields:

$$RWC = \frac{(MEC-AWC)}{DF} + AWC \qquad \text{(Equation B-4)}$$

For known MEC and AWC, Equation B-3 can be used to determine the required DF for a constituent by substituting water quality criteria for RWC. For cases where a DF and mixing zone have been authorized, Equation B-4 is rearranged to calculate the RWC at the boundary of the mixing zone in the RPA.

B.2 Maximum Projected Effluent Concentration

The spreadsheet tool calculates the MEC by applying a reasonable potential multiplier (RPM) based on a 99th percentile at a 95th confidence interval to the maximum observed concentration (MOC) for a parameter. In addition, DEC evaluates the distribution of the data set using EPA's *ProUCL Statistical Software Program, Version 4.1* rather than assuming a lognormal distribution as described in parts of the TSD in calculating the coefficient of variation (CV). The possible statistical distributions include normal, lognormal, gamma, or non-parametric.

The RPM is calculated differently depending on the type of distribution, CV of the data, and the number of data points. When fewer than 10 valid data points are available, the TSD recommends using

the assumption that the distribution is lognormal and the CV is equal to 0.6, a conservative estimate that assumes a relatively high variability.

For data sets with 10 or more valid data points CV is defined as the ratio of the sample standard deviation of the data set to the sample mean.

$$CV = coefficient\ of\ variation = \frac{standard\ deviation}{mean},$$

For data sets with a normal or gamma distribution or analyzed with the nonparametric method (Kaplan-Meier):

$$CV = \frac{\hat{\sigma}_y}{\hat{\mu}_y} \qquad \text{(Equation B-5)}$$

Where: $\hat{\mu}_y = estimated\ mean = \frac{\sum[x_i]}{k}, 1 \le i \le k$

$\hat{\sigma}_y{}^2 = estimated\ variance = \sum \frac{[(x_i - \mu)^2]}{k-1}, 1 \le i \le k$

$\hat{\sigma}_y = estimated\ standard\ deviation = (\sigma^2)^{0.5}$

$k = number\ of\ samples$

For data sets with a Lognormal distribution:

$$CV = [\exp(\hat{\sigma}_y^2) - 1]^{0.5} \qquad \text{(Equation B-6)}$$

Where: $y_i = \ln(x_i)\ for\ i = 1,2, \dots, k$

$\hat{\mu}_y = mean = \sum(y_i)/k$

$\hat{\sigma}_y^2 = variance = \sum[(y_i - \hat{\mu}_y)^2]/(k-1)$

$k = number\ of\ samples$

The RPM is the ratio of the upper bound of the distribution at the 99th percentile to the percentile represented by the MOC, at the 95% confidence level. The lognormal equations B-8 and B-9 are used as the input into Equation B-7 for lognormal distributions:

$$RPM = \frac{C_{99}}{C_{Pn}} \qquad \text{(Equation B-7)}$$

$$C_{99} = \exp[(Z_{99} * \hat{\sigma}_y) - (0.5 * \hat{\sigma}_y^2)] \qquad \text{(Equation B-8)}$$

$$C_{Pn} = \exp[(Z_{Pn} * \hat{\sigma}_y) - (0.5 * \hat{\sigma}_y^2)] \qquad \text{(Equation B-9)}$$

In the case when data are normal, gamma, or display no discernable distribution, Equations B-10 and B-11 are used as input into Equation B-7:

$$C_{99} = \hat{\mu}_n + Z_{99} * \hat{\sigma}$$ (Equation B-10)

$$C_{Pn} = \hat{\mu}_n + Z_{Pn} * \hat{\sigma}$$ (Equation B-11)

In Equations B-9 and B-11 the percentile represented by the MOC is:

$$p_n = (1 - confidence\ level)^{1/n}$$ (Equation B-12)

Where:

$$p_n = the\ percentile\ represented\ by\ the\ MOC$$

$$n = the\ number\ of\ samples$$

$$Confidence\ Level = 0.95\ for\ this\ analysis$$

In the event that the calculated RPM is less than one (1), the RPM value defaults to a value of one (1) per *RPA and WQBEL Guide*. The MEC is determined by multiplying the MOC by the RPM to derive the MEC:

$$MEC = (RPM) * (MOC)$$ (Equation B-13)

Either the acute or chronic RWC at the boundary of an authorized mixing can be determined using the MEC calculated in Equation B-3 and substituted into Equation B-4.The receiving water concentrations at the boundary of the mixing zones are then calculated as follows:

$$\mathrm{RWC_{a,c}} = \frac{\mathrm{MEC} - \mathrm{AWC}}{\mathrm{DF_{a,c}}} + \mathrm{AWC}$$ (Equation B-14)

Where:

RWC $_{a,c}$ = receiving water concentration at the boundary of the acute or chronic mixing zone,

AWC $_{a,c}$ = applicable water quality criteria, and

$DF_{a,\ c}$ = the authorized acute or chronic dilution factor.

If the RWC at either the acute or chronic mixing zone boundary is found to be greater than the respective criteria for the constituent, then reasonable potential is determined for that parameter and a WQBEL must be developed for that parameter.

B.3 Example Calculations for Discharge 015

Characterization of Discharge 015 in Fact Sheet Section 3.3.8.2identified total aromatic hydrocarbons (TAH) and copper as the driving parameters that would result in reasonable potential at the chronic and acute mixing zone boundaries, respectively, and require WQBELs.

B.3.1 Example Calculations for TAH as a Chronic WQBEL

The mixing zone analysis identified TAH as the driving parameter for the chronic mixing zone at the Osprey Platform and the Department authorizes a chronic mixing zone with a DF_c of 800. TAH is

found to have reasonable potential because the required dilution factor needed to meet TAH chronic water quality criteria is 806 and Department authorizes slightly less dilution than required to meet water quality criteria at the boundary. The following calculations demonstrate how TAH resulted in reasonable potential:

Number of effluent data (n) = 12

MOC = 6.93 mg/L

The Department calculated the CV based on the mean and standard deviation of raw data values obtained from *ProUCL-Version 4.1 Statistical Analysis Program* as shown below:

Mean of Raw Data ($\hat{\mu_n}$) = 5.945 mg/L, and

Standard Deviation of Raw Data ($\hat{\sigma}$) = 0.678 mg/L

CV = 0.114

A normal distribution applies to the data so equation B-8 applies to the RPM,

For a data set containing 12 TAH samples:

$$\text{Percentile represented by MOC } (p_n) = p_{12} = (1 - 0.95)^{1/12}$$

P_{12} = 0.7791 and Zp_{12} = 0.7691

By inputting values into Equation B-8 results in an RPM = 1.163

The MEC is then calculated by Equation B-11 as the product of the RPM x MOC

MEC = (1.163)(6.93 mg/L) = 8.06 mg/L

The chronic receiving water concentration is then calculated based on the following input parameters into Equation B-12:

AWC = 0 mg/L (Ambient samples analyzed were below detection)

DF_c = 800

Resulting in:

$$RWC_c = \frac{8.06\ mg/L_e - 0}{800} + 0\ mg/L = 0.0101\ mg/L$$

In order to determine if reasonable potential exists for the discharge to violate water quality criteria, the projected concentrations at the boundary of the chronic the mixing zone is compared to the water quality criteria. As shown in the comparison below, TAH has reasonable potential to violate applicable water quality criteria at the boundary of the chronic mixing zone.

Chronic: 0.0101 mg/L > 0.0100 mg/L (chronic criteria) **YES**, there is a reasonable potential.

Since there is a reasonable potential for the effluent to cause, or contribute to, an exceedance of chronic water quality criteria for protection of aquatic life, a WQBEL for TAH is required. See Appendix C for development of this limit.

B.5 Example Calculations for Copper as an Acute WQBEL

The mixing zone analysis identified copper as the driving parameter for the acute mixing zone at TBPF and the Department authorizes an acute mixing zone with a DF_a of 40, which is less than the dilution

factor required to meet acute water quality criteria for copper (40.5). The calculations demonstrating reasonable potential for copper are summarized below:

Number of effluent data (n) = 8

MOC = 71.3 µg/L Total Recoverable (Conversion factor for dissolved is 0.83)

Because the data set is less than 10, the DEC applies the default lognormal distribution assumption and CV = 0.6 per the *WQBEL & RPA Guide*:

CV = 0.6

A normal distribution applies to the data so equation B-8 applies to the RPM

For a data set containing 8 copper samples:

$$\text{Percentile represented by MOC } (p_n) = p_8 = (1 - 0.95)^{1/8}$$

$P_8 = 0.6877$ and $Zp_8 = 0.4892$

By inputting values into Equation B-8 results in an RPM = 3.11

The MEC is then calculated by Equation B-11 as the product of the RPM x MOC

MEC = (3.11)(71.3 mg/L) = 197.4 µg/L

The chronic receiving water concentration is then calculated based on the following input parameters into Equation B-12:

AWC = 0.926 µg/L (Represents the 85 percentile of ambient data)

$DF_c = 40$

Resulting in:

$$RWC_a = \frac{197.4 \text{ ug/L} - 0.926 \text{ ug/L}}{40} + 0.926 \text{ ug/L} = 5.84 \text{ µg/L}$$

In order to determine if reasonable potential exists for the discharge to violate ambient criteria, the projected concentrations of copper at the boundary of the acute the mixing zone is compared to the acute water quality criteria. As shown in the comparison below, copper has reasonable potential to violate applicable water quality criteria at the boundary of the chronic mixing zone.

Acute: 5.84 µg/L > 5.78 µg/L (acute criteria) **YES**, there is a reasonable

Since there is a reasonable potential for the effluent to cause, or contribute to, an exceedance of chronic water quality criteria for protection of aquatic life, a WQBEL for copper is required. See APPENDIX C for development of this limit.

APPENDIX C. BASIS FOR EFFLUENT LIMITATIONS

Per Alaska Administrative Code (AAC) 18 AAC 83.015, the Alaska Department of Environmental Conservation (Department or DEC) prohibits the discharge of pollutants to waters of the United States (U.S.) without first obtaining a permit issued by the Alaska Pollutant Discharge Elimination System (APDES) Program that meets the purposes of Alaska Statutes (AS) 46.03 and is in accordance with Clean Water Act (CWA) Section 402. Per these statutory and regulatory requirements, Individual Permit AK0053309 – Cook Inlet Energy, LLC, Osprey Platform (Permit) includes effluent limitations that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 – Alaska Water Quality Standards (WQS), and (3) comply with other state requirements that may be more stringent.

The CWA requires that the limits for each pollutant discharge parameter be the more stringent of either technology-based effluent limits (TBELs) or water quality-based effluent limits (WQBELs). TBELs are set via rule makings by the Environmental Protection Agency (EPA) in the form of Effluent Limitation Guidelines (ELGs) that correspond to the level of treatment that is achievable for a given industry using available technology. In situations where ELGs have not been developed, or have not considered specific discharges or pollutants, a regulatory agency can develop TBELs using best professional judgment (BPJ) on a case-by-case basis. A WQBEL is designed to ensure that WQS are maintained and the waterbody as a whole is protected. In cases where both TBELs and WQBELs have been generated for a particular parameter, the more stringent of the two limits will be selected as the final Permit limit for the parameter.

C.1 TECHNOLOGY-BASED EFFLUENT LIMITS (TBELs)

The following sections describe the applicable TBELs evaluated in Permit limit derivation. ELGs are TBELs developed by the EPA on an industry-by-industry basis and are intended to represent the greatest pollutant reductions that are economically achievable for a given industry. Per 18 AAC 83.430(a)(1), an APDES permit must include conditions meeting the requirements of applicable TBELs if they have been developed for the type of discharge authorized by the Permit. In establishing permit limits, DEC first determines which ELGs must be incorporated into the Permit and whether other TBELs using case-by-case BPJ should be adopted.

C.1.1 TBELs based on ELGs

EPA has promulgated national ELGs for the Oil and Gas Extraction Point Source Category at 40 CFR Part 435 Subpart D (Coastal Subcategory). DEC adopted the ELGs by reference at 18 AAC 83.010(g)(3). These subparts specify Best Available Technology Economically Achievable (BAT); or Best Conventional Pollutant Control Technology (BCT); or Best Practicable Control Technology Currently Available (BPT), and New Source Performance Standards (NSPS).

C.1.1.1 *Deck Drainage (002)*

The ELGs for BAT and BCT require a limitation of no discharge of free oil as determined by the presence of film, sheen, or a discoloration of the surface of the receiving water for deck drainage discharges. If the discharge occurs during conditions that obscure visual inspection of the surface (including ice), a Static Sheen Test must be performed.

C.1.1.2 *Graywater (004)*

The ELGs prohibit the discharge of foam per 40 CFR 435.43 (BAT) and floating solids and garbage per 40 CFR 435.44 (BCT).

C.1.1.3 *Produced Water (015 – New)*

EPA developed ELGs for produced water based on improved gas flotation being technically and economically achievable for Cook Inlet facilities. EPA established limitations on oil and grease in discharges of produced water as an indicator pollutant controlling the discharge of toxic and nonconventional pollutants, in part due to the infeasibility of regulating each pollutant individually. The most stringent ELGs for produced water are based on BAT and limit oil and grease to a maximum daily limit (MDL) of 42 mg/L and an average monthly limit (AML) of 29 mg/L per 40 CFR 435.43.

C.1.2 TBELs based on Case-by-Case Best Professional Judgement

In situations where ELGs have not been developed or have not considered specific discharges or pollutants, a regulatory agency can develop case-by-case TBELs based on BPJ using the same performance-based approach applied to develop national ELGs. Per CWA Section 402, developing limits using case-by-case BPJ requires the permitting authority to consider key aspects including the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impact (including energy requirements), the cost of implementing these conditions relative to the environmental benefits achievable, and other factors as deemed appropriate.

The Permit contains TBELs using case-by-case BPJ for graywater (004), miscellaneous wastes, collectively excess cement slurry (012) and fluids, cuttings, and cement at the seafloor (013). The following sections describe the case-by-case TBELs developed using BPJ and approved by the Department for use in the Permit.

C.1.2.1 *Miscellaneous Discharges (012 and 013)*

The following miscellaneous discharges consider TBELs developed using case-by-case BPJ for no discharge of free oil:

- (012) Excess Cement Slurry, and
- (013 – New) Fluids, Cuttings, and Cement at the Seafloor.

Limitations for these discharges were not specifically included in the ELGs and have been developed using case-by-case BPJ with considerations from the development of previous oil and gas permits in Cook Inlet. Note that the definition for no discharge of free oil in 40 CFR 435.41(y) includes miscellaneous discharges but miscellaneous discharges are not defined. Hence, these limitations appear consistent with the ELGs and have been previously vetted in other Cook Inlet oil and gas APDES permits based on considering aspects of CWA Section 402.

The Department has determined that there shall be no free oil visible down to a sheen (free oil) in those discharges that are most likely to be oil-contaminated. Specifically, a no free oil limitation is critical for excess cement slurry (012) and for fluids, cuttings and excess cement at the seafloor (013). Therefore additional attention is warranted for these two discharges in the form of a requirement for the development of discharge-specific BMPs to help ensure compliance with the no free oil limitation. The no free oil TBEL will be compared to the WQBEL of oil and grease (sheen) in subsequent sections.

The desalination unit wastes, boiler blowdown, fire control system water, and noncontact cooling water waste streams do not contact either the production stream (i.e., oil, water, or gas from the hydrocarbon-producing formation) or machinery surfaces where oily wastes would likely to contaminate them.

C.1.2.2 *Produced Water (015 – New)*

Similar to limitations for no free oil, DEC adopts pH limits of between 6.0 and 9.0 standard units for the discharge of produced water (015). Although produced water discharges were included in the ELGs, the ELGs did not include pH limits and pH is considered an appropriate control for chemical additives.

C.2 WATER QUALITY BASED EFFLUENT LIMITS

CWA Section 301(b)(1) requires the establishment of limits in permits necessary to meet WQS. All discharges to state waters must comply with WQS, including the Antidegradation Policy. Per 18 AAC 83.435(a)(1), APDES permits must include conditions to meet any applicable requirement in addition to, or more stringent than, TBELs (e.g., WQBELs) that "achieve WQS established under CWA Section 303, including State narrative criteria for water quality." The following sections discuss the potential parameters of concern (POCs) associated with each discharge, along with the WQBELs meeting 18 AAC 83.435 requirements.

C.2.1 Statutory and Regulatory Basis

Per 18 AAC 83.435(a), an APDES permit must include conditions (e.g., WQBELs) in addition to, or more stringent than established TBELs as necessary to protect WQS. When evaluating if WQBELs are needed in addition to TBELs, the permitting authority conducts a reasonable potential analysis (RPA) based on pertinent POCs. Pertinent POCs are those that the Department considers as having the potential to exceed water quality criteria at the point of discharge or at the boundary of a mixing zone, if authorized. If a mixing zone is authorized, the Department may consider the dilution available in the receiving water in the analysis. Per 18 AAC 83.435(c), DEC must also use procedures that account for effluent variability (e.g., maximum expected effluent concentrations [MEC] and coefficient of variation [CV]), existing controls on point sources (e.g., treatment systems), and nonpoint sources of pollution (e.g., ambient receiving water concentrations). The Department developed and implemented *a Reasonable Potential Analysis and Effluent Limits Development Guide, June 30, 2014* (*RPA/WQBEL Guidance*) and associated spreadsheet tool that were used in development of the WQBELs in the Permit.

C.2.2 Reasonable Potential Analysis

The RPA procedure requires calculating MECs based on the 99th percentile at a 95 percent (%) confidence interval and projects the receiving water concentrations at the boundary of the mixing zones using mass balance to determine whether concentrations of POCs exceed, or contribute to exceedance(s), of water quality criteria at the mixing zone boundaries. The applicable water quality criteria is provided by WQS or the *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, 2008 (*Toxics Manual*). Per Appendix B, DEC determined that total aromatic hydrocarbons (TAH) resulted in, or contributed to, an exceedance of water quality criteria for TAH at the boundary of the chronic mixing zone. DEC also determined that copper exceeded, or contributed to an exceedance, of copper criteria at the boundary of the acute mixing zone. Therefore, a WQBEL limit for TAH and copper are required for the Permit.

C.2.3 Wasteload Allocations

In the context of this section, a wasteload allocation (WLA) is the concentration of a pollutant that can be discharged to the receiving water and comply with the acute (a) or chronic (c) water quality criteria ($WQC_{a,c}$) when accounting for ambient receiving water concentrations (AWC) and authorized acute or chronic dilution factors ($DF_{a,c}$) in the mixing zones, if applicable.

For discharges where information on ambient receiving water concentrations is not available, DEC's practice is to calculate the ambient concentration (Amb) as 15 % of the most stringent applicable water quality criteria. DEC may also assume a concentration of zero, if there is adequate basis for the assumption; as in the case of EC bacteria which is not anticipated to be present in the ambient receiving water. Because water quality criteria for metals are provided as dissolved and limits are required to be reported as total recoverable, conversions using metals translators in *Toxics Manual, Appendix B – Conversion Factors for Saltwater Dissolved Metals Criteria*. The WLA is calculated by rearranging Equation B-3 in *Appendix B* and substituting WQC for receiving water concentration and WLA for the maximum expected concentration. The resulting mass balance equation is:

$$WLA_{a,c} = DF_{a,c}(WQC_{a,c} - Amb) + Amb$$

C.2.3.1 *Produced Water (Outfall 015) WLA for TAH*

For TAH in Outfall 015, the inputs for the WLA equation are shown below:

- $DF_a = 40$
- $DF_c = 800$
- $WQC_a = 5.78$ µg/L total copper
- $WQC_c = 3.73$ µg/L total copper
- $WQC_c = 0.01$ □g/L TAH (10 µg/L TAH)
- Copper Amb = 0.926 µg/L (85 percentile of ambient data)
- TAH Amb = 0 mg/L (based on no detection in ambient data)

Inputting the above values into the WLA equation results in the following WLAs for TAH and copper for the Outfall 015 mixing zones.

TAH: For TAH, there is no acute criteria so only the WLA_c applies.

WLA_c = 8.0 mg/L TAH (8,000 µg/L TAH)

Copper:

WLA_a = 195.2 µg/L copper

WLAc = 2,244 µg/L copper

C.2.4 *Long-Term Averages (LTAs)*

LTA_a and LTA_c concentrations are calculated from the acute and chronic WLAs using the following equations:

$$LTA_a = WLA_a * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$$\sigma^2 = \ln(CV^2 + 1)$$

z = 2.326 for 99th percentile probability basis

$$CV = coefficient\ of\ variation = \frac{standard\ deviation}{mean}$$

$$LTA_{chronic} = WLA_{chronic} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$$\sigma^2 = \ln\left(\frac{CV^2}{4} + 1\right)$$

z = 2.326 for 99th percentile probability basis

$$CV = coefficitent\ of\ variation = \frac{standard\ deviation}{mean}$$

C.2.4.1 *Outfall 015 LTAs and WQBEL for TAH*

Calculations

Determine Long Term Averages (LTAs)

The LTAs acute (a) and chronic (c) exposure were calculated as follows:

$LTA_c = WLA_c\ [\exp(0.5\sigma_4^2 - Z_{99}\sigma_4)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$

WLA_c = 8,000 µg/l, CV = 0.1141, Z_{99} = 2.326, and $\sigma_4^2 = 0.0032$

LTA_c = 7,018 µg/L

Determine the most limiting (lowest) LTA

LTA_c is most limiting = 7,018 µg/L

Calculate the End of Pipe MDL and AML

$MDL = LTA_c\ [\exp(Z_{99}\sigma - 0.5\sigma^2)]$, where $\sigma^2 = \ln(CV^2 + 1)$

CV = 0.1141, Z_{99} = 2.326, and $\sigma^2 = 0.0129$

MDL_{TAH} = 9,081 µg/L

Use 9.0 mg/L

$AML = LTA_c\ [\exp(Z_{95}\sigma_4 - 0.5\sigma_4^2)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$,

CV = 1.1, Z_{95} = 1.645, and $\sigma_4^2 = 0.0032$

AML_{TAH} = 7,695 µg/L

Use 7.7 mg/L

C.2.4.2 *Outfall 002 LTA and WQBEL for Copper*

Calculations

Determine LTA

The LTA_c exposure was calculated as follows:

$LTA_a = WLA\ [\exp(0.5\sigma^2 - Z_{99}\sigma)]$, where $\sigma^2 = \ln(CV^2 + 1)$

WLA_a = 195.3 µg/L, CV = 0.6, Z_{99} = 2.326, and $\sigma^2 = 0.3075$

LTA_a = 62.7 µg/L

$LTA_c = WLA_c\ [\exp(0.5\sigma_4^2 - Z_{99}\sigma_4)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$

WLA_c = 2,248 µg/L, CV = 0.6, Z_{99} = 2.326, and $\sigma_4^2 = 0.0862$

LTA_c = 1,183 µg/L

Use LTA_a = 62.7 as the limiting value

Calculate the End of Pipe MDL and AML

$MDL = LTA_a\ [\exp(Z_{99}\sigma - 0.5\sigma^2)]$, where $\sigma^2 = \ln(CV^2 + 1)$

CV = 0.6, Z_{99} = 2.326, and $\sigma^2 = 0.3075$

MDL_{copper} = 195 µg/L

$AML = LTA_a\ [\exp(Z_{95}\sigma_4 - 0.5\sigma_4^2)]$, where $\sigma_4^2 = \ln(CV^2/4 + 1)$,

CV = 0.6, Z_{95} = 1.645, and $\sigma_4^2 = 0.2770$

AML_{copper} = 97 µg/L

Other Applicable Numeric and Narrative WQBELs

C.2.4.3 *pH Criteria*

The water quality criteria for pH is no less than 6.5 SU and not greater than 8.5 SU. Discharges of produced water (Discharge 015) has a TBEL developed using case-by-case BPJ per Section C.1.2.2 applied at the compliance point prior to commingling. DEC has assessed the impacts of authorizing these limits and determined that these limits would not result in exceeding water quality criteria at the

boundary of the chronic mixing zone; the criteria will be reached in close proximity of the discharge due to available dilution and buffering capacity of the receiving water. Hence, the water quality criteria for pH can be exceeded within the mixing zone but not beyond the TBEL for pH (i.e., 6.0 to 9.0 SU).

C.2.4.4 *Narrative Requirement WQBELs*

Oil and Grease (Visual Sheen): Per 18 AAC 70.020(b)(17)(A)(i), there may be no concentrations of petroleum hydrocarbons in shoreline or bottom sediments that cause deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen or discoloration. This narrative WQBEL is compared to the no free oil TBEL in Section B.3

Residues: Residues include floating solids, debris, sludge, deposits, foam, or other objectionable conditions. Per 18 AAC 70.020(b)(20)(A)(ii), a discharge "may not, alone or in combination with other substances, cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines." Residues will be applied as a standard narrative permit condition in the Permit.

C.3 DETERMINATION OF MOST STRINGENT EFFLUENT LIMITS

DEC compared the TBELs for no free oil to the narrative oil and grease criteria for no hydrocarbons represented by an observation of a sheen on the water surface, shoreline, or bottom sediments. Because the narrative is more comprehensive, DEC uses the narrative limitation as the more stringent in the Permit.

APPENDIX D. MIXING ZONE ANALYSIS CHECKLIST

Mixing Zone Authorization Checklist

based on Alaska Water Quality Standards (2003)

The purpose of the Mixing Zone Checklist is to guide the permit writer through the mixing zone regulatory requirements to determine if all the mixing zone criteria presented in the Alaska Administrative Code (AAC) at 18 AAC 70.240 through 18 AAC 70.270 are satisfied, as well as provide justification to authorize a mixing zone in an Alaska Pollution Discharge Elimination System permit. In order to authorize a mixing zone, all criteria must be met. The permit writer must document all conclusions in the permit Fact Sheet. However, if the permit writer determines that one criterion cannot be met, then a mixing zone is prohibited, and the permit writer need not include in the Fact Sheet the conclusions for when other criteria were met.

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Size	Is the mixing zone as small as practicable? - Applicant collects and submits water quality ambient data for the discharge and receiving waterbody (e.g. flow and flushing rates)	Yes •Technical Support Document for Water Quality Based Toxics Control •Water Quality Standards Handbook • DEC's RPA Guidance • EPA Permit Writers' Manual Fact Sheet Section 5.3.2	18 AAC 70.240 (a)(2) 18 AAC 70.245 (b)(1) - (b)(7) 18 AAC 70.255(e) (3) 18 AAC 70.255 (d)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **If yes**, describe methods used in Fact Sheet Mixing Zone Analysis. Attach additional documents if necessary.	Yes Fact Sheet Section 5.3.3	18 AAC 70.240 (a)(3)	Y
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or documentation for the applicable parameters. Justify in Fact Sheet	N/A – Marine Discharge	18 AAC 70.255(f)	
Existing use	Does the mixing zone…			
	(1) partially or completely eliminate an existing use of the waterbody outside the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.4	18 AAC 70.245(a)(1)	Y
	(2) impair overall biological integrity of the waterbody? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.4	18 AAC 70.245(a)(2)	Y
	(3) provide for adequate flushing of the waterbody to ensure full protection of uses of the waterbody outside the proposed mixing zone?	Yes Fact Sheet Section 5.3.4	18 AAC 70.250(a)(3)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	If no, then mixing zone prohibited.			
	(4) cause an environmental effect or damage to the ecosystem that the Department considers to be so adverse that a mixing zone is not appropriate? **If yes, then mixing zone prohibited.**	No Fact Sheet Section 5.3.4	18 AAC 70.250(a)(4)	Y
Human consumption	Does the mixing zone…			
	(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 5.3.5	18 AAC 70.250(b)(2)	Y
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? **If yes, mixing zone may be reduced in size or prohibited.**	No Fact Sheet Section 5.3.5	18 AAC 70.250(b)(3)	Y
Spawning Areas	Does the mixing zone…			

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.6	18 AAC 70.255 (h)	Y
Human Health	Does the mixing zone…			
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.7	18 AAC 70.250 (a)(1)	Y
	(2) contain chemicals expected to cause carcinogenic, mutagenic, tetragenic, or otherwise harmful effects to human health? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.7		Y
	(3) Create a public health hazard through encroachment on water supply or through contact recreation? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.7	18 AAC 70.250(a)(1)(C)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? **If no, mixing zone prohibited.**	Yes Fact Sheet Section 5.3.7	18 AAC 70.255 (b),(c)	Y
	(5) occur in a location where the Department determines that a public health hazard reasonably could be expected? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.7	18 AAC 70.255(e)(3)(B)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
Aquatic Life	Does the mixing zone…			
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.8	18 AAC 70.250(a)(2)(A-C)	Y
	(2) form a barrier to migratory species? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.8		Y
	(3) fail to provide a zone of passage? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.8		Y
	(4) result in undesirable or nuisance aquatic life? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.8	18 AAC 70.250(b)(1)	Y
	(5) result in permanent or irreparable displacement of indigenous organisms? **If yes, mixing zone prohibited.**	No Fact Sheet Section 3.3.9	18 AAC 70.255(g)(1)	Y
	(6) result in a reduction in fish or shellfish population levels? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.8	18 AAC 70.255(g)(2)	Y
	(7) prevent lethality to passing organisms by reducing the size of the acute zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.2 and 5.3.8	18 AAC 70.255(b)(1)	Y

Criteria	Description	Resources	Regulation	Mixing Zone Approved Y/N
	(8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **If yes, mixing zone prohibited.**	No Fact Sheet Section 5.3.8 and 5.3.7	18 AAC 70.255(b)(2)	Y
Endangered Species	Are there threatened or endangered (T/E species) at the location of the mixing zone?If yes, are there likely to be adverse effects to T/E species based on comments received from United States Fish & Wildlife Service or National Oceanic & Atmospheric Administration. If yes, will conservation measures be included in the Permit to avoid adverse effects? **If yes, explain conservation measures in Fact Sheet. If no, mixing zone prohibited.**	Fact Sheet Sections 5.3.9 and 11.1	Program Description, 6.4.1 #5 18 AAC 70.250(a)(2)(D)	Y